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Development of an Effective Hydrant Maintenance Program for the North Ridgeville (OH) Fire Department

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Certification Statement

I herby certify that this paper constitutes my own product, that where the language of others is set fourth, quotation marks so indicate, and that the appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

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Abstract

The North Ridgeville Fire Department (NRFD) has in recent years had difficulty completing annual fire hydrant maintenance. The research's purpose was to determine, through evaluative research, possible procedure modifications by reviewing the NRFD's procedures, surrounding department's procedures, and national regulations. The results were the identification of maintenance procedures that the NRFD should perform on an annual basis. Recommendations included modifications to NRFD procedures and the transfer of hydrant records to a computerized database. The research attempts to support the hypothesis that proper testing and regular maintenance will result in the greater reliability of hydrants.

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Introduction

The North Ridgeville Fire Department operates two fire stations which divide the service area into two districts. The two districts have a combined total of over 2,000 fire hydrants. The Insurance Services Office (ISO) requires that fire hydrants are flushed and visually inspected twice annually for full credit or at least once annually to receive 80% credit (Hickey, 2002, p.202). The rapid growth of the City of North Ridgeville is making the task of completing annual hydrant inspections challenging. The problem is that the North Ridgeville Fire Department's current fire hydrant maintenance program is no longer effective. The inspection and flushing of the city's hydrants is not being completed on an annual basis. The main concern is that several near misses during emergency operations have occurred that may have been prevented by an effective hydrant inspection program.

The purpose of this research was to identify weaknesses in the current hydrant maintenance program and find effective solutions. Evaluative research was utilized to answer the following questions: (a) what type of maintenance and testing should the North Ridgeville Fire Department perform while flushing fire hydrants, (b) how are other fire departments in the same area of the North Ridgeville Fire Department using their personnel to complete fire hydrant maintenance, (c) would outsourcing fire hydrant maintenance to part-time employees within the North Ridgeville Water Department be cost effective?

Background and Significance

City of North Ridgeville

North Ridgeville is a suburban community located in northeast Ohio 20 miles west of Cleveland. The city has a population of 28,153 residing in a 25-square mile radius (City-Data, (n.d.), p.1). Since originally established as Ridgeville Township on May 10, 1810, the city has seen subsequent growth. In recent years, the city was named one of the 10 fastest growing suburbs in Ohio having added 1605 homes over the past four years for a total of 10,936 housing units (North Ridgeville Building Department, 2008). The city is mainly a bedroom community with some commercial and light industry.

North Ridgeville Fire Department

The North Ridgeville Fire Department (NRFD) is the largest dual-role fire department in Lorain County providing both fire protection and emergency medical services. The NRFD employs 36 full-time members which operate from two fire stations. Dispatch for the department is performed by an off-site regional dispatch center. The department also participates in a county based hazardous materials and technical rescue team. The NRFD promotes itself as an all-hazards emergency organization.

Hydrant Maintenance Program

The NRFD in cooperation with the North Ridgeville Water Department has maintained the city's fire hydrants since inception. The city has water lines and hydrants throughout the city that serve the residential, commercial, and industrial areas. The only areas that currently are without water are the Ohio Turnpike, State Route 10, and the Norfolk Southern railroad tracks that divide the city in half (North Ridgeville Water

Department, 2008). Any new residential or commercial developments are required to install water lines and hydrants (North Ridgeville Code of Ordinances, (n.d). Traditionally, the NRFD has assigned on-duty personnel during warm weather months to flush and test the city's fire hydrants. This practice has changed throughout time by the number of personnel assigned to hydrant maintenance at any given time. It has gone from assigning one member in a utility vehicle to several in-service crews assigned at one time. All hydrants are flushed and then tested for both static and flow pressures. These figures are then recorded on hydrant cards along with the corresponding gallons per minute (gpm). Because of the city's aging water system, crews place pressure relief valves on hydrants throughout the test areas to prevent the accidental breakage of water lines while shutting hydrants down during flushing. The water department also asks that the NRFD flush and test hydrants during the hours of 8am and 2pm Monday through Friday to prevent overtime in the case of an accidental water line break. Anytime a hydrant is found to be non-operational or in need of repair it is reported to the water department for service.

The problem is that the NRFD's current hydrant maintenance program is no longer effective. In 1998, the NRFD flow and pressure tested 1250 fire hydrants using on-duty personnel (North Ridgeville Fire Department, 1998). In 2008, the NRFD flow and pressure tested only 1190 hydrants using on-duty personnel that were just slightly increased from 1998 (North Ridgeville Fire Department, 2008). The author believes that a substantial increase in emergency calls combined with a minor increase in personnel has resulted in the decrease in the number of hydrants that are flushed and pressure tested each year.

It is believed that the decrease in the effectiveness of the hydrant maintenance program has had some negative impact on the readiness of our department. The department has experienced two near misses that are believed to be the result of outdated maintenance and inspection procedures. The first incident was in June of 2005 when crews discovered that a hydrant had the wrong threads while fighting a house fire. The second was in September of 2005 when a water line failed as the result of emergency operations.

A fire department's hydrant maintenance program is an example of risk reduction as defined in the *Executive Analysis of Community Risk Reduction* curricula (Fema, 2008). "Community risk reduction combines prevention and mitigation strategies. Risk prevention involves anticipating potential hazards within a community and facilitating interventions to prevent occurrences. Risk mitigation involves anticipating potential hazards within a community and facilitating interventions to diminish adverse outcomes" (Fema, 2008). The basis of the research problem is the potential hazard that a non-working hydrant(s) poses during a fire emergency. Establishing a plan and solving this problem is a direct example of risk mitigation. Having measures in place, such as an effective hydrant maintenance program to prevent a potential disaster, is risk prevention. This being said, there is a definite link between the hydrant maintenance program and the content of the Executive Analysis of Community Risk Reduction course.

One of the five USFA operational objectives is "The USFA will focus on reducing the number of firefighter deaths by 25% over five years" (USFA, 2001). An effective hydrant maintenance program will have a direct effect on the safety of firefighters. An example of this is the dependence on properly functioning hydrants

during initial fire attacks. Most fire departments depend on apparatus water tanks to initiate a fire attack. The goal is to either put the fire out with the tank water or contain it until firefighters outside of the structure obtain a continuous supply of water from a hydrant. If the outside firefighters are unable to locate an effective hydrant quickly, inside attack crews can be injured or killed when the apparatus tank water runs out. This example provides a definite link between an effective hydrant maintenance program and the USFA operational objective of reducing the number of firefighter deaths.

Literature Review

The need for fire departments to ensure a reliable water system is dictated by the dependence on water in extinguishing fires. The International Fire Service Training Association (IFSTA, 1988) recognizes that "knowing the capacity of a water system is just as important as knowing the capacities of pumpers and water tanks" (p. 93). Knowledge of a city's water system by firefighters is as important as knowledge of the city's streets and districts. If you cannot locate the fire or a water source to extinguish it, you probably will not be very successful with suppression. In his applied research paper *Ensuring a Reliable Water Source During Emergency Operations,* Sturgeon observes "that when a hydrant fails to operate it subjects the purveyor and the fire department to public scrutiny and residents erroneously associate the maintenance of fire hydrants with the fire department thereby holding them accountable if the system fails" (Sturgeon, 2006, p.9). Although a court of law may not agree with this assumption, loss of the public's trust may be just as detrimental. Mrs. Smith assumes that when she sees the fire department flushing the hydrant on her tree lawn that they know how, when, and where to do it.

The North Ridgeville Fire Department (NRFD) has been experiencing recent problems with the tracking and flushing of the city's fire hydrants. The enormous growth that the city has experienced in recent years has resulted in a number of new fire hydrants and water lines. The Orange County Florida Fire Rescue Department also had a problem with evaluating the hydrant system reliability and performing preventative maintenance. Their problem resulted in a hydrant failure at a structure fire in which a citizen was killed. This triggered public outcry and numerous press inquiries (Sturgeon, 2006, p.6).

The *2009 Drinking Water Survey Inspection* which was conducted by the Ohio EPA Division of Drinking and Ground Waters revealed that "68%, 1% and 44% of the hydrants in North Ridgeville were flushed in 2008, 2007, and 2006 respectively" (Appendix A). The Ohio EPA expressed their concern in this matter and suggested that "the city should consider making improvements in this very important area of system maintenance and prevention of water quality deterioration" (Appendix A). Sturgeon warns that "an ineffective or inadequate water supply will reduce the efficacy of even the best firefighting techniques and could endanger the public and firefighters, as well as, independent and exposure occupancies" (Sturgeon, 2006, p. 21).

In addition to the findings of the Ohio EPA, the NRFD has experienced several other significant operational problems while dealing with our hydrant maintenance problem. In June of 2005, our crews were called for a report of a structure fire in a small single-family ranch style home (Appendix B). On arrival, crews made a routine interior fire attack and attempted to connect to the fire hydrant closest to the home. Upon opening the hydrant, the large diameter hose (LDH) line that was attached blew off of the hydrant due to mismatched threads. Apparently, when the hydrant was installed the steamer threads were not as specified by city ordinance (North Ridgeville Code of Ordinances (n.d). The engine operator eventually obtained a continuous supply of water by utilizing two 2.5" supply lines from the same hydrant. If the hydrant had been properly inspected at the time of installation or thoroughly inspected on an annual basis, this near-miss may not have happened. If the engine operator hadn't been fast acting, crews inside may have been injured when they ran out of tank water.

The most recent procedure which the NRFD has used for inspecting hydrants involves using pressure relief devices known as blow offs (Appendix C). As a matter of fact, the NRFD uses three pressure relief devices on every street while performing hydrant flushing and testing. The reason for the excessive use of the pressure relief devices is that in past year's hydrant flushing crews were thought to have caused water line breaks. As is apparent by this written procedure (Appendix C), hydrant flushing and testing has become a very slow and time consuming activity. The AWWA suggests that "closing the hydrants is more critical and it must be done very slowly until the flow has diminished to about 20 percent of full flow" (AWWA, 1999a, p. 43). During a May 7, 2009 meeting held by the North Ridgeville Engineering Department, there was a discussion about the fire department's practice of using multiple pressure relief devices while flushing. It was suggested by Joe Horvac of the North Ridgeville Service Department that "the fire department does not have to go to those lengths to prevent a water line break" (Horvac, personal communication, May 7, 2009). Mr. Horvac explained that "all the fire department needs to do is open a hydrant to a trickle in the area in which they are flushing hydrants" (Horvac, personal communication, May 7, 2009). This practice will take the place of the pressure relief devices and make the process less labor intensive. Another procedure that the NRFD follows is the annual static and flow testing of every hydrant that is flushed (Appendix C). Although this practice allows for the accurate documentation of pressures on every hydrant in the city, it also is time consuming. The combination of these activities lends little time to items such as ensuring that each hydrant has the correct threads.

In September of 2005, NRFD crews were again called to a small single family home for the report of a kitchen fire (Appendix D). As per procedure, the engine operator hooked an LDH supply line to the closest hydrant and opened it. In this case, the operator received water but it appeared to be a less than expected flow. The fire was extinguished successfully, but there was a question about the hydrant's lack of pressure. It was soon discovered by incoming units that the water line supplying the hydrant had broke and was leaking further down the same street. Apparently, either opening the hydrant or the shutting down of a valve or nozzle by fire crews had caused the break. The NRFD's hydrant card for the hydrant that was used during the emergency revealed that the hydrant had not been flushed or inspected for 13 months (Appendix G). After the repair of the water line, this same hydrant was not flushed or inspected again for fourteen months (Appendix G). If there had not been a fire, the hydrant in question would not have been opened for 27 months.

Flow Testing

The NRFD currently attempts to obtain a static and flow test on every hydrant that is flushed each year. This practice dates back to when the department went full-time in 1967 (R.E. Miller, personal communication, May 1, 2009). When the department completed flushing of all of the hydrants annually, the result was up to date flow records. Unfortunately, this labor intensive practice is believed to be one of the reasons that our department is unable to complete our annual hydrant flushing. The current procedure has the inspector of each hydrant place a gauged 2 ½" cap on one hydrant outlet and open the hydrant to obtain a static reading. The inspector then closes the hydrant, removes the

opposite 2 ½" hydrant cap and fully opens the hydrant to obtain a flow reading (Appendix C). This procedure is performed annually on every hydrant that is flushed.

The Insurance Services Office (ISO) notes in their *Grading Schedule* that "the inspection condition of fire hydrants should be in accordance with American Water Works Association (AWWA) manuals" (Hickey, 2002, p. 202). AWWA suggests that "it is good practice to conduct flow tests on all parts of the distribution system approximately every 10 years (or whenever needed) to identify the service areas affected by significant changes in the distribution system" (AWWA, 1999a, p. 39). The guideline allows the department to perform flow testing at a rate of 10% of the hydrants each year and still be in compliance with the ISO *Grading Schedule*.

NFPA 291, *Recommended Practice for Fire Flow Testing and Marking of Hydrants,* 2007 edition states that "fire flow tests are conducted on water distribution systems to determine the rate of flow available at various locations for fire fighting purposes" (NFPA, 2007, Section 1.2). The type of flow test that is recommended brings the NRFD's procedure into question. NFPA 291 states that the flow testing procedure "consists of discharging water at a measured rate of flow from the system at a given location and observing the corresponding pressure drops in the mains" (Section 4.2). The flow test that the NRFD conducts on each hydrant only consists of opening the hydrant that is tested (Appendix C). The AWWA provides a detailed field procedure for testing hydrants (AWWA, 1999a, p. 41). The first step in the field procedure is identical to the way in which the NRFD establishes a static pressure. The second step which establishes a flow pressure utilizes two flow hydrants and a residual hydrant which are opened simultaneously to record an accurate flow pressure (p. 41).

This procedure provides a more accurate picture of the fire flows that are available. It also allows one to get an idea about the flows available if a department needs to utilize more than one hydrant location during an emergency. The fire flow available is then determined by using residual pressure and an established flow calculation chart (AWWA, 1999a, p. 43). IFSTA reports that "fire protection engineers have established 20 psi as the minimum required residual pressure when computing the available water for are flow test results" (NFPA, 2007, p. 101).

Maintenance

The procedure that the NRFD currently employs for hydrant maintenance entails an inspection of the hydrant's exterior gaskets and lubrication (Appendix C). All remaining maintenance is performed by the North Ridgeville Service Department. Past painting of the hydrants has been performed by labor that was provided by the Lorain County Correctional Division.

The performance of basic maintenance is well within the knowledge of firefighting staff. Mahoney recommends that "members of first-due engine companies should perform hydrant inspections" (Mahoney, 2004, p. 57). Mahoney feels that "maintenance tends to improve when inspections are made by those likely to use the hydrant" (p. 57). The condition of hydrants is also more of a concern to someone whose life may depend on them. The *Fire Chief's Handbook* states that "it is up to the Chief to see that hydrant maintenance is done properly and on schedule" (Barr & Eversole, 2003, p. 511). The combination of the two theories results in the conclusion that the fire department is a major stakeholder in hydrant inspection and maintenance.

The Author has found that all of the research sources agree that the inspection of dry barrel hydrants must include the assurance that the hydrants properly drain or are pumped out to prevent freezing. This practice appears to be a fundamental element that should be included in any inspection program in areas with freezing temperatures. Repair of dry-barrel hydrant drains will reduce the number of hydrants which must be pumped out each season. AWWA suggests that "after-use inspections are especially important for dry-barrel hydrants" (AWWA, 1999b, p.29).

The *Fire Chief's Handbook* lists the procedures that "a good maintenance inspection should include" (Barr & Eversole, 2003, p. 512). The procedures are as follows: Checking visually for hydrant damage, performing a pressure test, flushing the hydrant, checking the drain operation, checking the condition of outlet threads with a female coupling, ensuring free management of hydrant cap chains, checking cap gaskets, lubricating cap and outlet threads, lubricating hydrant if necessary, and painting and color coding according to national standards (p. 512). These procedures appear to make up a thorough maintenance inspection that would identify any defects. Of particular concern to the NRFD is the procedure of checking the condition of outlet threads with a female coupling which may have prevented a near miss situation (Appendix B). Another great suggestion is to confirm that the street valve is fully open while checking the hydrant (USFA, 2008). Many times workers shut down a hydrant to perform repairs and either forget to turn them back on or do not fully open the street valve.

Most procedures performed in the field by firefighting personnel require basic skills. Sometimes lubrication of hydrants can complicate the process. The AWWA recommends that "for detailed information on how to lubricate a particular hydrant,

contact the hydrant's manufacturer" (AWWA, 199b, p. 31). This is a valuable suggestion and should be followed on each type of hydrant within a particular system. It should also be noted that the information obtained from the hydrant manufacturer should be forwarded to all hydrant inspection personnel.

Record Keeping

The NRFD currently uses a hydrant card system that has been in place since the inception of the city's water system. The cards are numbered by hydrant and include location, make, street valve location, date inspected, static pressure, flow pressure, gallons per minute, initials of inspector, and a place for remarks (Appendix G). The cards have served the department well for years but have become antiquated in today's technology age. The hydrants used to be numbered as they were installed starting with the number one. This method provided an accurate hydrant count and identifying system. The problems with the numbering system began when the city started extending water lines years after they had been in use. The new hydrants were installed and given the next consecutive numbers. This resulted in situations where hydrant number 700 may follow hydrant 350 on the same street. This created confusion and forced the department to abandon this numbering system (R.E. Miller, personal communication, May 1, 2009). Unfortunately, a new system has not yet been identified and the department currently identifies hydrants by the closest address.

The NRFD currently uses Firehouse Software to complete the national fire incident reporting system (NFIRS) reports and EMS reports to the State of Ohio. To the knowledge of the author, the department has never attempted to utilize the hydrant

maintenance portion of the program or its reports. The hydrant maintenance portion of the Firehouse Software is a computerized database for fire hydrant records. The program tracks basic information like make, owner, and capacity (ACS, 2008, p. 216). It also provides the ability for tracking hydrant activities such as inspections, repairs, and flow tests (p. 216). Once you have entered measurements from flow tests, flow calculations are automatically calculated by the program (p. 217). North Ridgeville's neighboring department in Avon, Ohio is currently using the Firehouse Software for all hydrant records. The Avon Fire Department assigns numbers to their hydrants based on street names and addresses. For example, Main5490 would be an assigned hydrant number that you would find in Avon's Firehouse database (AFD, 2008).

Record keeping is crucial to the success of a hydrant maintenance program. To be successful, the system must record the location, make, type, size, and date of installation for each hydrant in addition to repair information (AWWA, 1999b, p. 33). It is also suggested that this data be kept in hard copy or transferred to a database on a computer (p. 33). Hydrant records should reflect information concerning all inspections and repairs made to a particular hydrant. This information is especially important in identifying a troubled hydrant or reporting activities to ISO (p. 33). The Spartanburg public safety department utilizes a hydrant file system which entails keeping a single file for each hydrant (Spartanburg, 2008, p.4). A hard copy system such as this would allow for extensive hydrant information but would be difficult to access from the field. Other departments, such as the Sedona, Arizona fire district, are utilizing the hydrant section of the Firehouse Software (Sedona (n.d.), p.1).

Personnel Utilization

The NRFD has experimented with several methods of utilizing personnel for hydrant maintenance duties. The traditional method was to send one on duty firefighter out in a utility truck to flush and test hydrants by him/herself. This method used to work sufficiently but ceased to work when the department transferred dispatch to a regional dispatch center which eliminated an extra daytime staff member. It also became inefficient as the city has grown and the number of hydrants has increased. Another method that was attempted was the assignment of three member crews from each station which would take both an ambulance and a truck with them on the detail because they were in service and responsible for both fire and EMS response in their districts. The problem with this method was that when the hydrant crew received an emergency call, they were forced to leave the remaining piece of apparatus parked somewhere on a city street or in a parking lot unattended. The current method is a combination of both which seems to work for the time being. If there is a better method for our department to utilize our staffing to perform hydrant maintenance, it has not yet been identified.

Several years ago, it was suggested by the North Ridgeville Firefighters, Local 2129 that the fire department should hire firefighters off duty to perform hydrant maintenance. The reason cited was that the department was having difficulty completing hydrant maintenance duties due to an increase in the number of emergency calls, required training, company inspections, and preplan development. This was agreed on and the Fire Chief asked for and received funding in order to try this method. Unfortunately, the Chief and the Union disagreed on which hourly wage from the collective bargaining agreement would be used and the trial never moved forward. Several years later, the Chief again

asked for and received funding in order to hire seasonal employees through the city's service department to perform the hydrant testing and flushing duties. During this attempt, the department had unexpected costs so the budgeted money was transferred and used for something else.

In 1980, the City of Littleton, Colorado Fire Department experimented with using temporary civilian personnel to inspect and test each hydrant within their district (Young, 1981, p. 48). The department found that this practice was not only a cost savings, but it showed some signs of improvement in their inspection program (p. 49). The main benefits were a substantial savings in wages and more uniform inspections because they were all performed by the same person (p. 48). The idea that the NRFD may also benefit from this type of program became apparent. According to the City of North Ridgeville Auditor's Office, a Part-time Laborer who is employed by the city's service department is currently earning $8.54/hour (Appendix H). According to the city's Treasurer, Anthony Hatmaker, all part-time employees are also covered by Ohio Workman's Compensation which increases the cost to the city by 3%/hour (A. Hatmaker, personal communication, May 20, 2009). This would bring the city's cost per hour for the part-time employee to $8.80. The Treasurer also reported that part-time employees over the age of 16 are insured to operate city-owned vehicles without any additional cost to the city (A. Hatmaker, personal communication, May 20, 2009).

The NRFD would use the part-time employee(s) to perform hydrant maintenance Monday through Friday each week in the months of June, July, and August. This would result in the part-time employee working 12 weeks or 480 hours and cost the city $4,224.00/summer for one part-time employee. One issue at hand is that the North

Ridgeville Service Department has an unwritten policy which ensures that there must be at least two employees working together when duties entail working in traffic. This would result in the hydrant crew being made up of two members at all times at a cost of $8,448.00/summer. The Treasurer also warned that “part-time employees traditionally don’t take as good of care of equipment as the full-time employees”, which he based on complaints that he has received from other employees (A. Hatmaker, personal communication, May 20, 2009).

Procedures

Research for this paper began with a literary search utilizing the electronic card catalog of the learning resource center (LRC) located at the National Fire Academy in Emmitsburg, Maryland. The search for pertinent material was also assisted by the staff at the learning resource center. The search began by entering the following terms into the electronic card catalog search engine: fire hydrant, hydrant, hydrant maintenance, hydrant repair, water system maintenance, and hydrant flushing. The information that was reviewed included standards from the National Fire Protection Association (NFPA), guidelines from the American Water Works Association (AWWA), magazine articles, applicable applied research projects and a textbook from the International Fire Service Training Association (IFSTA).

On May 7, 2009 the author attended a meeting held by the North Ridgeville Engineering Department to discuss the *2009 Drinking Water Survey Inspection* that was completed by the Ohio Environmental Protection Agency (EPA). The meeting was held to discuss solutions to concerns that the Ohio EPA had with North Ridgeville’s water

system (Appendix A). One of the matters which were discussed with some length was the frequency which the city's fire hydrants were being flushed.

A fire hydrant maintenance questionnaire was devised based on the review of the literature (Appendix F). The questionnaire was mailed to 102 communities in a three county area surrounding North Ridgeville. Along with the questionnaire each community received an accompanying letter (Appendix E) and a postage-paid return envelope.

The purpose of the questionnaire was to determine what type of maintenance and testing that fire departments in the same geographical area as North Ridgeville are performing and how they are utilizing their personnel to do so. Fire departments in the same geographical area were used because they all experience similar weather conditions and seasons. There were 15 basic questions that could be answered in a short amount of time.

1. What is the make-up of your fire department?
2. How many members make up your fire department?
3. What is your typical daily staffing?
4. What is the population of the area which you serve?
5. How many fire hydrants are there in the area which you serve?
6. How many of the hydrants from question #5 are private hydrants?
7. Who in your area performs fire hydrant flushing duties?
8. If your fire department performs hydrant flushing, how are the duties assigned?
9. How often are hydrants flushed in the area in which you serve?
10. What type of maintenance is performed on hydrants while flushing them?
11. Is every hydrant that is flushed also pressure tested?

12. If you answered no to question #11, what determines whether or not a hydrant is pressure tested?
13. Does your city/township/village flush and inspect private hydrants or is it the responsibility of the property owner?
14. How does your organization maintain fire hydrant records?
15. What is your department's ISO rating?

Out of 102 questionnaires mailed out, 73 (72%) were returned. According to the Creative Research Systems Sample Size Calculator (www.surveysystem.com/sscalc.htm), it can be assumed that with the number of questionnaires returned there is a 95% confidence level in the results.

The main limitation of the questionnaire was the way in which questions were interpreted by the responders. For example, the question asking "what type of maintenance is performed on your hydrants while flushing them" was meant to learn about what was done to each hydrant on an annual basis. Most responders checked off every type of maintenance that is performed whether on an annual basis or as needed. Another limitation of the questionnaire was that there was confusion with the question that asked about daily staffing totals. The volunteer and combination departments had a difficult time answering the question and this caused inconsistencies in the results.

Results

Research Questions

Research question one: What type of maintenance and testing should the North Ridgeville Fire Department perform while flushing fire hydrants?

The most basic type of maintenance that the North Ridgeville Fire Department (NRFD) should perform is annual flushing of all fire hydrants within the service area. This statement is based on recommendations from the American Water Works Association (AWWA, 1999b) and the Ohio EPA, Division of Drinking and Ground Waters (Appendix A). Flow testing should be incorporated into the annual flushing of hydrants. The AWWA suggests that "it is good practice to conduct flow tests on all parts of the distribution system approximately every 10 years (or whenever needed) to identify the service areas affected by significant changes in the distribution system" (AWWA, 1999a, p.39). Flow testing will provide the NRFD with an accurate picture of the fire flows that are available.

Some basic maintenance should be performed during annual hydrant flushing. A good maintenance inspection should include: checking for hydrant damage, performing a pressure test, checking the drain, checking the condition of the outlet threads, ensuring free management of hydrant cap chains, checking cap gaskets, and lubrication (Barr & Eversole, 2003, p. 512). The performance of these items is well within the knowledge of firefighting staff and can be performed during the flushing process.

Research question two: How are other fire departments in the same area of the North Ridgeville Fire Department using their personnel to complete fire hydrant maintenance?

Research question two was heavily dependent on the answers to the questionnaire that was mailed to the surrounding departments. The responses to the questionnaire made it immediately obvious that hydrant duties are performed by on-duty personnel in the majority of cases. 67% of the departments reported using on-duty personnel. The figure appears to be related to the fact that 74% of the departments were either career or combination departments. Most of the remaining was volunteer departments that used either volunteers or the city's water department to perform hydrant maintenance duties. Fire department personnel perform the hydrant flushing duties in 75% of the cities with 71% of those using on-duty companies that are in service. None of the departments take units out of service to perform hydrant maintenance and only five reported using paid off-duty personnel.

Research question three: Would outsourcing fire hydrant maintenance to part-time employees within the North Ridgeville Water Department be cost effective?

Exploring the idea of hiring part-time employees to perform hydrant maintenance was another topic of the literature review. Five of the surrounding departments use paid off-duty personnel but none reported using part-time employees. The model that was used was that of Littleton, Colorado which hired temporary civilian personnel to inspect and test each hydrant within their district (Young, 1981, p. 48). The City of Littleton

claimed to have experienced a cost savings and more uniform inspections due to their temporary seasonal employees (p. 48).

It appears that the only costs that the City of North Ridgeville would incur with hiring part-time employees for hydrant maintenance would be for two employee's hourly rate plus 3% for Ohio Workman's Compensation (Appendix H). The total cost would equal about $8,448.00 for the two part-time employees.

Questionnaires

The paper based questionnaires were sent out by U.S. Mail with a self-addressed stamped return envelope and a cover letter enclosed. The questionnaires were sent to every fire department in three counties which border North Ridgeville. The questionnaires for the fire departments included demographic characteristics of the respondents, number of public and private hydrants, personnel usage, and the different types of maintenance that is performed.

The results of the questionnaires provided a large amount of useful information. Of the 73 departments that responded to the questionnaire, 45% were combination, 40% were career, and the remaining 15% volunteer. The departments were mainly small departments with less than 50 members and the majority served a population of 10,000 to 25,000. 30% of the departments had fewer than 500 hydrants in their service area and 26% had between 500 and 1000. The remaining served in areas with more than 1,000 hydrants. The number of private hydrants each department reported was from 0 up to 348. The average Insurance Services Office (ISO) rating reported by the respondents was five.

The first question asked was concerning how hydrant maintenance duties are assigned among personnel. A majority of 67% reported using on-duty personnel. This figure corresponds with the fact that 74% of the departments were either career or combination departments. The next question inquired about the frequency with which hydrants are flushed each year. Again, 67% reported flushing hydrants once a year while only 25% flush hydrants more than once a year. There were three departments that reported flushing hydrants less than once a year. The types of maintenance question formed some commonalities. Every department that answered the questionnaire reported that lubrication is part of their hydrant maintenance duties. Pressure testing of some type also seemed common among respondents. 35% perform static tests, 43% perform flow tests, and 24% perform residual tests. Very few departments report painting their hydrants, but surprisingly 33% report making repairs to hydrants which entail replacing worn parts.

Of particular interest was the question which asked if the department's pressure test each hydrant that is flushed; only 15% reported doing so. A question about inspecting private hydrants revealed that half of the respondents maintain the private hydrants in their service area. Lastly, it was found that a resounding 93% of respondents use either Firehouse or another computer software to maintain fire hydrant records.

Discussion

The research for this project was benefited by the use of national regulations such as those provided by the National Fire Protection Agency (NFPA), Insurance Services Office (ISO), and the American Water Works Association (AWWA). The results of the research in combination with past near misses have established the need to perform proper fire hydrant maintenance annually. As Sturgeon observed "when a hydrant fails to operate it subjects the purveyor and the fire department to public scrutiny and residents erroneously associate the maintenance of fire hydrants with the fire department thereby holding them accountable if the system fails" (Sturgeon, 2006, p. 9). The need for annual testing is a well followed belief in the geographical area of the NRFD as is obvious by the response that the questionnaire received (Appendix F). When asked how often hydrants are flushed, 71% of the respondents reported that they flush them at least annually and 28% reported flushing them more than once a year. This supports the suggestion of the Ohio EPA which was that hydrant flushing should be performed at least annually (Appendix A).

The importance of flow testing and the time parameters which it should be performed were useful findings from the research. The AWWA suggests that "it is good practice to conduct flow tests on all parts of the distribution system approximately every 10 years (or whenever needed) to identify the service areas affected by significant changes in the distribution system" (AWWA, 1999a, p. 39). Sturgeon also warned "an ineffective or inadequate water supply will reduce the efficacy of even the best firefighting technique and could endanger the public and firefighters, as well as, independent and exposure occupancies" (Sturgeon, 2006, p. 21). Unfortunately, many of

the respondents wrote on the questionnaire (Appendix F) that they only flow test hydrants when there has been a repair made or if there is a question about the pressure in a specific area.

General maintenance of hydrants varied throughout the departments which responded to the questionnaire. Most departments (89%) lubricated hydrants while flushing them (Appendix F). Lubrication and the replacement of cap gaskets are the most common types of maintenance required and can be performed by firefighting personnel. Unexpectedly, 32% of respondents reported performing repairs that included replacing worn parts. The *Fire Chief's Handbook* lists the procedures that "a good maintenance inspection should include" (Barr & Eversole, 2003, p. 512). One type of maintenance which was specific to our geographical location is the prevention of frozen hydrants in cold weather. Repair of dry-barrel hydrant drains or pumping out hydrants each season will reduce the number of frozen hydrants encountered.

Record keeping in general is evolving throughout the fire service. This was found to be true concerning the maintenance of hydrant records. The respondents to the questionnaire reported that 93 percent are utilizing Firehouse or similar software, while only 7 percent are still using a hydrant card system (Appendix F). Record keeping is crucial to the success of a hydrant maintenance program and to be successful, the system must record the location, make, type, size, date of installation, and repair information (AWWA, 1999b, p. 33). The hydrant maintenance portion of the Firehouse Software is a computerized database for hydrant records. The program tracks all of the required information (ACS, 2008, p. 216).

The research concerning personnel utilization was of specific interest to the NRFD. Most of the information concerning personnel utilization was gathered through the use of the questionnaire. In a 1980 experiment, the City of Littleton, Colorado found that the use of temporary civilian personnel to perform hydrant inspections was a cost savings and showed some signs of improvement in their hydrant inspection program (Young, 1981, p. 49). The research established that it would cost the City of North Ridgeville an estimated $8,448.00 to fund the same type of program. It was also found that North Ridgeville has not always had positive results in hiring temporary civilian personnel. North Ridgeville Treasurer, Anthony Hatmaker warned “part-time employees traditionally don’t take as good of care of equipment as full-time employees” (A. Hatmaker, Personal Communication, May 20, 2009).

The largest percentage of respondents to the questionnaire (69%) reported using in-service, on-duty companies to perform hydrant maintenance (Appendix F). Mahoney supported this response by pointing out that “maintenance tends to improve when inspections are made by those likely to use the hydrant” (Mahoney, 2004, p. 57).

The Author’s interpretation of the study results is that the NRFD is in need of some changes in its hydrant maintenance program. Fire hydrant flushing, inspection, and general maintenance should be performed at least annually. Flow testing of hydrants should be performed at least every 10 years (or as deemed necessary) in order to have a general understanding of the distribution system’s capabilities. Hydrant records would be more accessible if entered into and maintained using a computer software program. Use of temporary personnel to perform hydrant maintenance may be a step backwards and

should only be used to supplement the maintenance performed by on-duty firefighting personnel.

Recommendations

The research for this ARP has identified several weaknesses in the North Ridgeville Fire Department's (NRFD) current hydrant maintenance program and ways in which it can be improved. The recommendations should be considered in order to develop new policy so that the program will comply with current standards.

The importance of hydrant flushing at least yearly has been established by the research. Unfortunately, the NRFD has not completed the annual flushing of hydrants in several years. It is of vital importance that the department performs an annual flushing of the city's hydrants. The first recommendation in completing this goal is the use of a minimum of two on-duty companies each day to perform hydrant flushing during warm climates. The next recommendation is to stop the use of the manpower intensive pressure relief devices that the department currently uses. Following the recommendation of the city's water department in slightly opening a hydrant in the system during maintenance should greatly reduce the chance for a water main break. The department should consider the development and use of standardized flushing, maintenance, and flow testing procedures that will expedite the process and assure consistency. These procedures should be developed and then used to train firefighting personnel prior to performing annual hydrant flushing.

The research has supported the idea that general hydrant maintenance can and should be performed by firefighting personnel. This said the NRFD should develop a

standardized maintenance procedure using the procedures outlined in the *Fire Chief's Handbook.* The department should also work with the city's water department to repair any hydrant in the city that does not drain properly. Both of these actions will help greatly in avoiding another near-miss situation involving a fire hydrant.

It has become obvious from the research that the department must trade its hydrant card system in for computer software. Since the NRFD is already using the Firehouse Software for other tasks and it is the most widely used in our area, the department should acquire training on the hydrant maintenance portion of the Firehouse Software and incorporate it into the hydrant maintenance program. The NRFD should also consult the Avon (OH) Fire Department on its hydrant numbering system and try to replicate it.

Lastly, the use of on-duty firefighting personnel to perform hydrant maintenance should be the first choice in completing annual inspections. Although the monetary cost to the city is not great with part-time civilian personnel, the benefits of having the personnel who count on the hydrants to perform their maintenance would be lost. Once the department is performing an effective annual inspection and maintenance of all hydrants, it is possible part-time civilian crews could be incorporated to perform a second flushing of all hydrants annually. Future readers should consider the aspects of this ARP that apply to their organization and adjust accordingly. Weather restrictions and the type of hydrants in an area greatly affect the testing and maintenance of hydrants.

References

Affiliated Computer Services, Inc. (ACS). (2008). Firehouse Software [user's manual]. Retrieved January 5, 2009, from http://www.firehousesoftware.com/pdf/FH7UserGd.pdf

American Water Works Association. (1999a). Flow Tests. *Installation, field testing, and maintenance of fire hydrants* (pp. 39-50). Denver, CO: The Association.

American Water Works Association. (1999b). Maintenance. *Installation, field testing, and maintenance of fire hydrants* (pp. 28-38). Denver, CO: The Association.

Avon Fire Department (AFD). (2008). *2008 Hydrant Report.* Avon, OH: Author.

Barr, R.C. & Eversole, J.M. (Eds.). (2003) *Fire Chief's Handbook.* Tulsa, OK: Pennwell Corporation.

City-Data. (n.d.) *North Ridgeville, Ohio Detailed Profile.* Retrieved January 26, 2008, from http://www.city-data.com/city/North-Ridgeville-Ohio.html

Federal Emergency Management Agency (FEMA). (2008). *Executive Analysis of Community Risk Reduction.* Student Manual, National Emergency Training Center.

Hickey, H.E. (2002). Water Supply. C. Babec, *Fire suppression rating schedule handbook* (pp. 196-204). Louisville, KY: Chicago Spectrum Press.

International Fire Service Training Association. (1988). *Water supplies for fire protection.* (4th ed.), Stillwater, OK: Author.

Mahoney, E.F., (2004). *Fire Department Hydraulics.* Upper Saddle River, NJ: Pearson Education Inc...

National Fire Protection Association. (2007). *Recommended practice for fire flow testing*

and marking of hydrants (NFPA 291). Quincy, MA: Author.

North Ridgeville Code of Ordinances. (n.d.). Chapter 1640, *Fire Hydrants.* Retrieved March 3, 2006, from http://www.amlegal.com/nxt/gateway.dll/ohio/nridgeville_oh/partsixteen-firepreventioncode/

North Ridgeville Fire Department. (1998). Fire Department 1999 Annual Report. North Ridgeville, OH: Author.

North Ridgeville Fire Department. (2008). Fire Department 2008 Annual Report. North Ridgeville, OH: Author.

Sedona Fire District. (n.d.). *Hydrant Maintenance and Testing.* (Standard Operating Procedure No. 355). Sedona, AZ: Author.

Spartanburg Public Safety Department Fire Division. (2008). *Hydrant Inspection/Maintenance Program.* (Standard Operating Procedure No. 106.05). Spartanburg, SC: Author.

Sturgeon, W.E. (2006). *Ensuring a reliable water supply during emergency operations.* Unpublished manuscript.

U.S. Fire Administration (USFA). (2001, March). *Fire Research Agenda.* United States Fire Administration: Author.

U.S. Fire Administration. (2008, August). Fire Hydrant Inspection and Testing Frequency. *Coffee Break Training,* No. 2008-32. Retrieved February 2, 2009, from http://ww.usfa.dhs.gov/downloads/pdf/coffee-break/cb_2008_32.pdf

Young, R.A. (1981, June). Budget-wise hydrant maintenance program. Fire Chief, V. 25 (6), 48-50.

Appendix A

2009 Drinking Water Survey Inspection

City of North Ridgeville
Larry J. Griffith, P.E. City Engineer
Engineering Department

May 11, 2008

Scott D. Moegling, P.E.
Environmental Specialist 3
Division of Drinking and Ground Waters
2110 East Aurora Road
Twinsburg, Ohio 44087

Re: 2009 Drinking Water Survey Inspection
PWS ID # OH4700803
STU ID # 4755821

Dear Mr. Moegling:

Below are the regulatory requirements and recommendations with answers, as listed in your April 3, 2009 report for which the City of North Ridgeville must take action to return to compliance and to address deficiencies that may have the potential to cause future violations or contamination.

REQUIRED

1. *Security and housekeeping at the elevated tank is a concern to this office and must be addressed. Specifically, it appears a number of departments with the City government have access to and utilize storage space within the tank shell. When questioned about security, it was revealed that the door to the tank has been left open in the past. We strongly encourage the City ensure the security system is functioning and adequate, the number of people given access to the area is limited to a reasonable number, and all persons given access are trained on the importance of protecting the security of a critical potable water facility.*

   Housekeeping inside the tank must be improved to ensure sanitary control of the area is maintained at all times. Specifically, it was noted that a boat was in storage, a number of car seats were stacked against the wall, and a police evidence cage was located inside the tank shell with a number of items of concern that will remain unnamed. Additionally, a tall stack of boxes filled with papers was located very close to a suspended heating unit and poses a potential fire hazard.

Security is functional. Clearly printed instructions are posted at the entrance door and all employees using the facility have been shown how to use the alarm. There are limited keys to the facility so, if the alarm has not been correctly set, we know who to talk to. We are not aware of any recent time when the alarm was left unarmed while the facility was unmanned.

Appendix A (cont.)

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Management of storage in the facility is ongoing. We will address general conditions as well as the concerns raised. The gasoline has been removed, the car seats are going to be removed and the hazardous police evidence will be relocated.

2. *The City of North Ridgeville Emergency Contingency Plan was outdated and inaccurate. Information in the report must be current and should be reviewed at least annually to ensure accuracy and completeness. Mr. Horak will be provided a copy of the Inspection Report, which will identify items to be considered with the plan. In addition, a copy of Ohio Administrative Code 3745-85-01 will be provided for his guidance. Please ensure all telephone numbers are correct. An updated copy of the Emergency Contingency Plan must be provided to this office upon completion.*

The employee list with phone numbers has been updated and copy is attached. A copy has been given to all plan holders.

3. *The Backflow Prevention program appears to be adequate. However, it was noted that 52 devices were not tested in 2008. In accordance with OAC 3745-95-06(C)(3), devices are to be tested at least annually. We understand you are pursuing these customers, and that the majority of these devices are pressure vacuum breakers on sprinkler systems. Please ensure these devices are tested as required and that accurate, complete test records are filed in accordance with OAC 3745-95-06 (C). Additionally, please ensure periodic surveys of existing backflow devices are conducted to ensure the appropriate protection is provided, in accordance with OAC 3745-95-03.*

Per the 52 devices mentioned above and all other outstanding testing, letters have been distributed letters to all residents who have irrigation systems that were installed late in the year and that failed to forward test results. They have all been informed to have their system tested at the time of reactivation in 2009. Reports are coming in daily as the residents become compliant. The irrigation system installers and plumbing companies are all receiving a letter asking them to inform the homeowner of the installation test requirement and need to send in the reports. A letter is attached to the permit application and the Building Department will not pass inspection unless the test is completed and passed. The monitoring system we have in place requires any existing structure being modified for use to install an updated backflow installation RPZ ASSE 1013 with thermal expansion to the cold feed side of the hot water system or boiler.

RECOMMENDATIONS

1. *The City inquired about operators having dual water supply and water distribution licenses and the difficulty meeting the contact hour requirements to maintain both licenses. Neither the Distribution 2 nor the Water Supply 1 licenses "outrank" each other, thereby making one unnecessary for North Ridgeville's current system licensing requirements. However, effective July 1, 2009, North Ridgeville will become a Distribution 2 system based upon the population increasing to above 25,000 persons. Therefore, the Distribution 2 license will be **required** at that time and the Water Supply 1 license will be*

Appendix A (cont.)

2009 Drinking Water Survey Inspection

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irrelevant for your system's needs. It may still be in your personal interest to keep the Water Supply 1 license current, however. We understand that Mr. Horak and Mr. Roth have Distribution 2 licenses. To continue with the answer to your question posed during the survey, a Water Supply 2 license would "outrank" a Distribution 2 license.

Please ensure the City continues improving employee bench strength and encourages additional employees to pursue licensing. The new operator certification rules make it a longer process to reach higher levels of certification, and this should be budgeted for in terms of staff development time and continuing education funding.

The City will continue to fund development time and continued education to maintain the system and the employees to do so.

2. *Based upon the results of the survey questions, it appears the City does not have a written Preventive Maintenance (PM) program, an overall Operation and Maintenance (0 & M) plan, nor dedicated budgets for each. There is, however, a Capital Improvements Plan (CIP) that is created for the Ohio Public Works Commission submittal. We encourage the City to consider developing a written 0 & M plan to ensure all areas of operation and maintenance receive proper evaluation and prioritization. Additionally, the PM plan and 0 & M plan could be dovetailed with the CIP to ensure all areas of the system are addressed in a structured, planned manner. Finally, we recommend the City develop a formal master plan for development within the City limits. This is particularly important for determining future utility capacity needs. We discussed that the City has a relatively large area of 'green space' which could become future residential development and/or commercial development. Proper planning for these areas is particularly important for a fast growing city like North Ridgeville.*

Current programs will be placed in writing. Consulting firms will be contacted for proposals and the City will pursue grants for funding the work.

3. *The City reported an unaccounted for water loss of approximately 20%. The industry standard for unaccounted for water is 15%. We understand that not all city buildings/facilities are metered, which contributes to this number. It should be noted that the North Ridgeville water system was created in 1957, so the oldest pipe in the system is only 50 years old. The 20% figure seems unreasonably high. We recommend the City begin investigating for potential leaks and possibly employ a leak detection company to conduct an audit. Metering of all customers should be considered, even if the City determines that these water users should be non-revenue customers. Finally, we recommend the City consider a more aggressive meter replacement program. We understand that approximately 7.33% of the meters are replaced annually and that the City is proposing to increase this percentage to 17%. We encourage the City to continue this effort.*

As the fastest growing community in NE Ohio, we add thousands of feet of new water main every year. Each new main and all replaced mains require a substantial amount of unmetered water to flush the lines before and after chlorination. Unaccounted for water historically stands at nearer 10%. Several major water breaks and a (now repaired) problem with the water tower overfilling last year could both be responsible for the loss increase. A program to install a new AMR meter system citywide is currently underway. The City also plans to begin installing meters in all city

Appendix A (cont.)

2009 Drinking Water Survey Inspection

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building and facilities.

4. *In light of comment No. 3 above, we have concerns with the City's current water rate structure. An evaluation of the rate indicates the typical homeowner pays about $300 to $325 per year for water, based upon an average usage of 7756 gallons (1037 cubic feet) per month. The median household income (MHI) of the North Ridgeville water system service area was approximated at $54,482 using the 2000 US Census data. The ratio of the water rate to the MHI, therefore, is 0.55% to 0.60%. This figure falls well below Ohio EPA's range of 1.3% to 3.1% used to evaluate the financial capability of a public water system. The City reported an unaccounted water figure of 20%. Therefore, the City should consider reducing expenses by locating and repairing leaks, and should consider increasing revenue by billing from unmetered/non-revenue accounts, installing newer meters (particularly on large use accounts), and possibly seeking a rate increase.*

A general water rate increase of 17% has been passed by Council and is now in place. In addition we have a system that automatically increases rates as they increase from our suppliers. Also, as a fast growing community, we regularly use water tap fees to supplement water usage rates when necessary. We do not believe our rate structure impedes our ability to manage our system.

5. *We discussed the distribution system in detail and identified that a number of dead end mains exist in the City. Dead end lines lead to poor circulation, hydraulics, and water quality. This is important with regards to compliance with the TTHM and HAAS MCLs under the Disinfectants/Disinfection Byproducts Rule now and the Stage 2 rules forthcoming. Please consider means of reducing water age in your system by eliminating dead end lines currently in the system and prohibiting the construction of dead end lines in the future. Updating your distribution system maps may be a key tool in eliminating dead end lines. The City reportedly has not updated maps since 2006 due to manpower issues. As these maps are updated, you may wish to include the fire hydrant and valve inventories and locations as part of the City's GIS effort. This information could also be of assistance with the development of a hydraulic and/or water quality computer model that can be useful with master planning as discussed in the Recommended Item No. 2 above.*

Growth in the system is currently used to address dead end lines wherever possible. New subdivisions will be given a closer look to reduce the dead end water line situation.

6. *We recommend the City improves the valve exercising program. The number of valves exercised in 2006 through 2008 was 120, 250, and 900, respectively. The exact number of valves in the system is not known at this time as an inventory program is still being conducted. We recommend the City prepare an accurate inventory and location of all valves in the system and ensure valves are turned on a yearly basis, at a minimum, to ensure proper operation.*

We've been trying to get the inventory and location done for years. It's part of our GIS/GPS project. Valves are currently exercised but we will make the job a priority.

Appendix A (cont.)

2009 Drinking Water Survey Inspection

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7. *We understand the fire department flushes fire hydrants for the water department. Please ensure the hydrants are flushed in accordance with commonly accepted standards. Specifically, all hydrants should be flushed annually (at a minimum), at a supplying pipe velocity of 2.5 feet per second, and done in a uni-directional manner. The white Distribution Operations monthly operating report indicated that 68%, 1%, and 44% of the hydrants were flushed in 2008, 2007, and 2006, respectively. The City should consider making improvements in this very important area of system maintenance and prevention of water quality deterioration. In addition, the fire department personnel should be trained how to appropriately flush hydrants for water quality considerations. We understand Mueller Hydrant representatives have been out to the City and have offered to provide training on this for water department and fire department personnel. We encourage the City to take advantage of this and possibly consider obtaining approval for operator certification contact time for this training.*

I believe all appropriate Fire and Service personnel are trained in operating hydrants but we plan to have Mueller conduct a call for City personnel. We do check for hydrant flushing operation in the area of any water break. Fire personnel involved will be retrained. The fire department is currently working on a plan to at minimum flush every hydrant this year. A set of plan for new subdivisions will be given to the Fire Department for their use.

8. *The City should consider installation of appropriate auxiliary generators at key locations. It would appear that the Cleveland Street pump station would be the most critical location at this time. Additionally, the City may wish to have a portable generator available in the event the Sugar Ridge pump vault would be needed during a power outage. While we understand the City has a number of connections with RLCWA, Avon Lake, and Elyria, the capability of providing continuous water service without depressurizing under all situations is of paramount importance and should be considered a primary goal in public health protection.*

Service maintains several portable generators. One of these may be appropriate for the Cleveland Street pump. I know of no other need. The Avon Lake facility maintains generator backup of all main pumps and that pressure from those pumps, along with our gravity water tower should provide ample pressure during an outage.

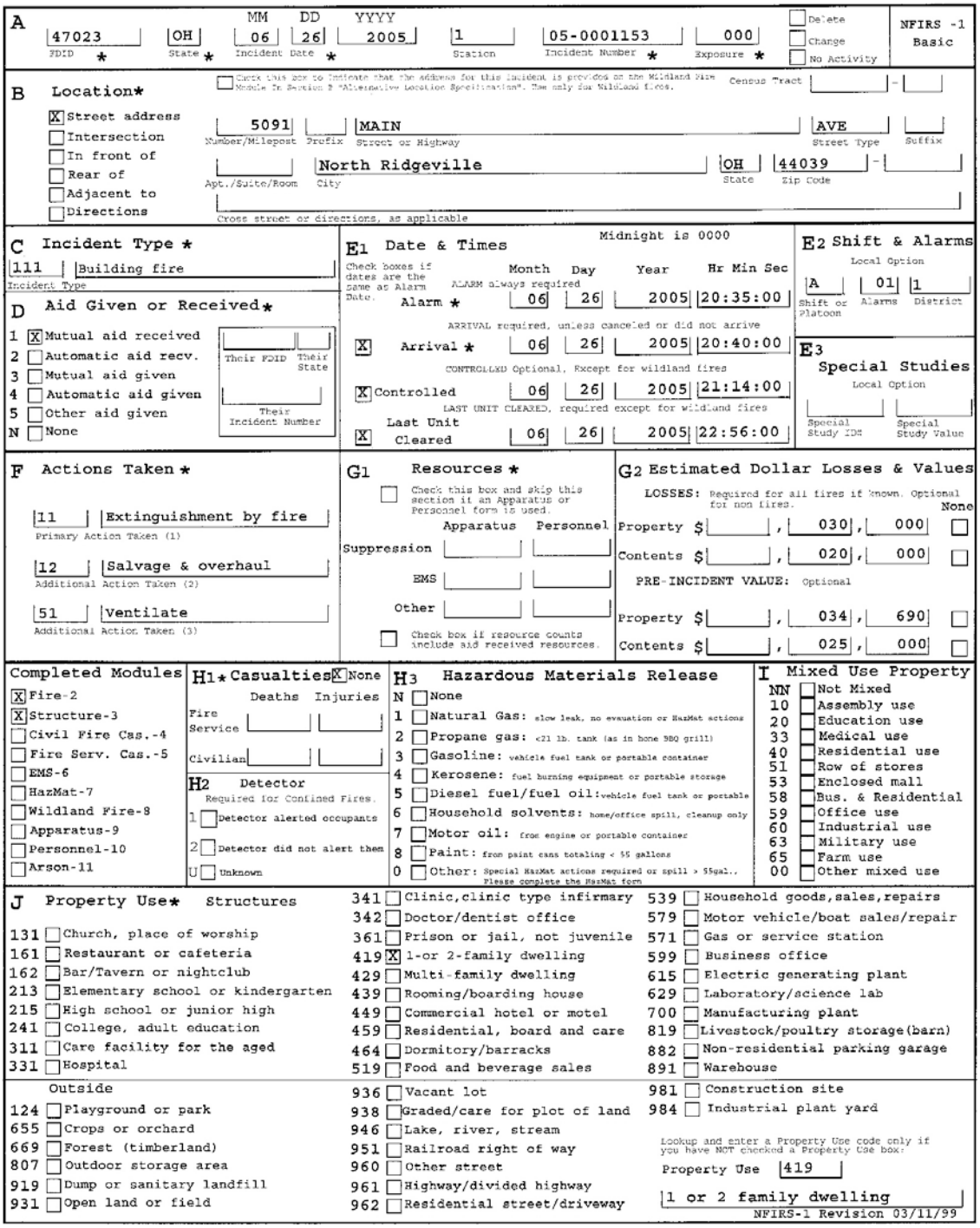
Please let me know if you have any questions.

Respectfully,

Larry J. Griffith, P.E.
City Engineer

Appendix B

Fire Run #1153



A
47023 FDID * | OH State * | MM 06 DD 26 YYYY 2005 Incident Date * | 1 Station | 05-0001153 Incident Number * | 000 Exposure * | Delete / Change / No Activity | NFIRS -1 Basic

B Location*
Check this box to indicate that the address for this incident is provided on the Wildland Fire Module In Section B "Alternative Location Specification". Use only for Wildland fires. Census Tract
X Street address / Intersection / In front of / Rear of / Adjacent to / Directions
5091 Number/Milepost | Prefix | MAIN Street or Highway | AVE Street Type | Suffix
Apt./Suite/Room | North Ridgeville City | OH State | 44039 Zip Code
Cross street or directions, as applicable

C Incident Type *
111 Building fire — Incident Type

D Aid Given or Received*
1 X Mutual aid received
2 Automatic aid recv.
3 Mutual aid given
4 Automatic aid given
5 Other aid given
N None
Their FDID | Their State | Their Incident Number

E1 Date & Times
Midnight is 0000
Check boxes if dates are the same as Alarm Date. Month Day Year Hr Min Sec
ALARM always required
Alarm * 06 26 2005 20:35:00
ARRIVAL required, unless canceled or did not arrive
X Arrival * 06 26 2005 20:40:00
CONTROLLED Optional, Except for wildland fires
X Controlled 06 26 2005 21:14:00
LAST UNIT CLEARED, required except for wildland fires
X Last Unit Cleared 06 26 2005 22:56:00

E2 Shift & Alarms
Local Option
A Shift or Platoon | 01 Alarms | 1 District

E3 Special Studies
Local Option
Special Study ID# | Special Study Value

F Actions Taken *
11 Extinguishment by fire — Primary Action Taken (1)
12 Salvage & overhaul — Additional Action Taken (2)
51 Ventilate — Additional Action Taken (3)

G1 Resources *
Check this box and skip this section if an Apparatus or Personnel form is used.
Apparatus Personnel
Suppression
EMS
Other
Check box if resource counts include aid received resources.

G2 Estimated Dollar Losses & Values
LOSSES: Required for all fires if known. Optional for non fires. None
Property $, 030 , 000
Contents $, 020 , 000
PRE-INCIDENT VALUE: Optional
Property $, 034 , 690
Contents $, 025 , 000

Completed Modules
X Fire-2
X Structure-3
Civil Fire Cas.-4
Fire Serv. Cas.-5
EMS-6
HazMat-7
Wildland Fire-8
Apparatus-9
Personnel-10
Arson-11

H1 * Casualties X None
Deaths Injuries
Fire Service
Civilian

H2 Detector
Required for Confined Fires.
1 Detector alerted occupants
2 Detector did not alert them
U Unknown

H3 Hazardous Materials Release
N None
1 Natural Gas: slow leak, no evacuation or HazMat actions
2 Propane gas: <21 lb. tank (as in home BBQ grill)
3 Gasoline: vehicle fuel tank or portable container
4 Kerosene: fuel burning equipment or portable storage
5 Diesel fuel/fuel oil: vehicle fuel tank or portable
6 Household solvents: home/office spill, cleanup only
7 Motor oil: from engine or portable container
8 Paint: from paint cans totaling < 55 gallons
0 Other: Special HazMat actions required or spill > 55gal.. Please complete the HazMat form

I Mixed Use Property
NN Not Mixed
10 Assembly use
20 Education use
33 Medical use
40 Residential use
51 Row of stores
53 Enclosed mall
58 Bus. & Residential
59 Office use
60 Industrial use
63 Military use
65 Farm use
00 Other mixed use

J Property Use* Structures
131 Church, place of worship
161 Restaurant or cafeteria
162 Bar/Tavern or nightclub
213 Elementary school or kindergarten
215 High school or junior high
241 College, adult education
311 Care facility for the aged
331 Hospital
341 Clinic, clinic type infirmary
342 Doctor/dentist office
361 Prison or jail, not juvenile
419 X 1-or 2-family dwelling
429 Multi-family dwelling
439 Rooming/boarding house
449 Commercial hotel or motel
459 Residential, board and care
464 Dormitory/barracks
519 Food and beverage sales
539 Household goods, sales, repairs
579 Motor vehicle/boat sales/repair
571 Gas or service station
599 Business office
615 Electric generating plant
629 Laboratory/science lab
700 Manufacturing plant
819 Livestock/poultry storage (barn)
882 Non-residential parking garage
891 Warehouse

Outside
124 Playground or park
655 Crops or orchard
669 Forest (timberland)
807 Outdoor storage area
919 Dump or sanitary landfill
931 Open land or field
936 Vacant lot
938 Graded/care for plot of land
946 Lake, river, stream
951 Railroad right of way
960 Other street
961 Highway/divided highway
962 Residential street/driveway
981 Construction site
984 Industrial plant yard

Lookup and enter a Property Use code only if you have NOT checked a Property Use box:
Property Use 419
1 or 2 family dwelling

NFIRS-1 Revision 03/11/99

Appendix B (cont.)

Fire Run #1153

K1 Person/Entity Involved (Local Option)

Business name (if applicable) | Area Code | Phone Number

☐ Check This Box if same address as incident location. Then skip the three duplicate address lines.

Mr.,Ms., Mrs. | First Name | MI | Last Name | Suffix

Number | Prefix | Street or Highway | Street Type | Suffix

Post Office Box | Apt./Suite/Room | City

State | Zip Code

☐ More people involved? Check this box and attach Supplemental Forms (NFIRS-1S) as necessary

K2 Owner (Local Option) ☐ Same as person involved? Then check this box and skip the rest of this section.

Business name (if Applicable) | Area Code: 440 | Phone Number: [redacted]

☒ Check this box if same address as incident location. Then skip the three duplicate address lines.

Mr.,Ms., Mrs. | First Name: [redacted] | MI | Last Name: [redacted] | Suffix

Number: 5091 | Prefix | Street or Highway: MAIN | Street Type: AVE | Suffix

Post Office Box | Apt./Suite/Room | City: North Ridgeville

State: OH | Zip Code: 44039

L Remarks (Local Option)

U/A L-22 (I.C.) FOUND SMALL RANCH HOME WITH HEAVY FIRE SHOWING FROM A & C SIDES. 1.75" LINE ATTACKED THROUGH FRONT DOOR. 2/5" LINE THROUGH REAR OF HOME (C). AVON FD M/A VENTED ROOF OVER BEDROOMS ON A/B CORNER OF RESIDENCE. TOTAL HEAT AND SMOKE DAMAGE TO HOME, FLAME DAMAGE TO LIVING ROOM, KITCHEN AND MAIN CORRIDOR. 3 RESIDENTS IN HOME. HOMEOWNER STATES SHE HAD COOKING OIL BOILING ON STOVE AND LEFT IT UNATTENDED MOMENTARILY. OWMER CAME BACK TO FIND KITCHEN CABINETRY FULLY INVOLVED. EVERYONE EXITED HOME AND 911 CALLED. INVESTIGATION BY AC BEMENT IS CONSISTENT WITH STATEMENTS OF HOME OWNERS. FIRE ON D SIDE OF HOME EXTENDED RADIANT HEAT TO CAMPER TRAILER IN DRIVEWAY. RESIDENTS LEFT IN CARE OF RED CROSS. NO INJURIES OR FATALITIES, FIRE OR CIVILIAN. FIRE KNOCKED DOWN WITHIN 20 MINUTES. SALVAGE AND OVERHAUL CONDUCTED.

L Authorization

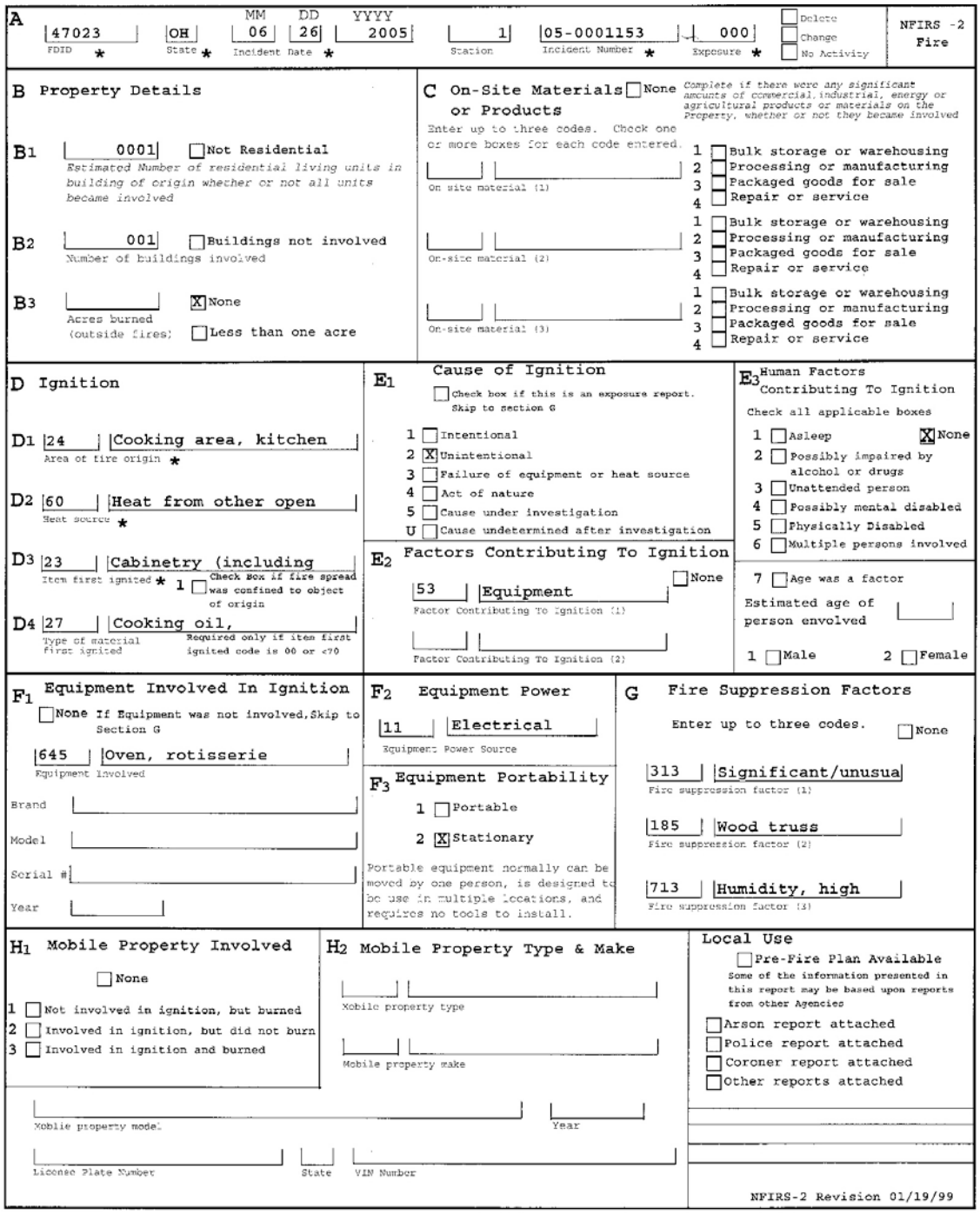
Officer in charge ID	Signature	Position or rank	Assignment	Month	Day	Year
GRL-971	Laborie, Gregory R	LTP		06	26	2005

Check Box if same as Officer in charge. ☒

Member making report ID	Signature	Position or rank	Assignment	Month	Day	Year
GRL-971	Laborie, Gregory R	LTP		06	26	2005

Appendix B (cont.)

Fire Run #1153



A
47023 FDID * | OH State * | MM 06 DD 26 YYYY 2005 Incident Date * | 1 Station | 05-0001153 Incident Number * | 000 Exposure * | ☐ Delete ☐ Change ☐ No Activity | NFIRS -2 Fire

B Property Details

B1 0001 ☐ Not Residential
Estimated Number of residential living units in building of origin whether or not all units became involved

B2 001 ☐ Buildings not involved
Number of buildings involved

B3 ☒ None
Acres burned (outside fires) ☐ Less than one acre

C On-Site Materials ☐ None or Products
Complete if there were any significant amounts of commercial, industrial, energy or agricultural products or materials on the property, whether or not they became involved
Enter up to three codes. Check one or more boxes for each code entered.

On site material (1)
On-site material (2)
On-site material (3)
1 ☐ Bulk storage or warehousing
2 ☐ Processing or manufacturing
3 ☐ Packaged goods for sale
4 ☐ Repair or service

D Ignition

D1 24 Cooking area, kitchen
Area of fire origin *

D2 60 Heat from other open
Heat source *

D3 23 Cabinetry (including
Item first ignited * 1 ☐ Check Box If fire spread was confined to object of origin

D4 27 Cooking oil,
Type of material first ignited — Required only if item first ignited code is 00 or <70

E1 Cause of Ignition
☐ Check box if this is an exposure report. Skip to section G
1 ☐ Intentional
2 ☒ Unintentional
3 ☐ Failure of equipment or heat source
4 ☐ Act of nature
5 ☐ Cause under investigation
U ☐ Cause undetermined after investigation

E2 Factors Contributing To Ignition ☐ None
53 Equipment
Factor Contributing To Ignition (1)
Factor Contributing To Ignition (2)

E3 Human Factors Contributing To Ignition
Check all applicable boxes
1 ☐ Asleep ☒ None
2 ☐ Possibly impaired by alcohol or drugs
3 ☐ Unattended person
4 ☐ Possibly mental disabled
5 ☐ Physically Disabled
6 ☐ Multiple persons involved
7 ☐ Age was a factor
Estimated age of person envolved
1 ☐ Male 2 ☐ Female

F1 Equipment Involved In Ignition
☐ None If Equipment was not involved, Skip to Section G
645 Oven, rotisserie
Equipment Involved
Brand
Model
Serial #
Year

F2 Equipment Power
11 Electrical
Equipment Power Source

F3 Equipment Portability
1 ☐ Portable
2 ☒ Stationary
Portable equipment normally can be moved by one person, is designed to be use in multiple locations, and requires no tools to install.

G Fire Suppression Factors
Enter up to three codes. ☐ None
313 Significant/unusua
Fire suppression factor (1)
185 Wood truss
Fire suppression factor (2)
713 Humidity, high
Fire suppression factor (3)

H1 Mobile Property Involved
☐ None
1 ☐ Not involved in ignition, but burned
2 ☐ Involved in ignition, but did not burn
3 ☐ Involved in ignition and burned

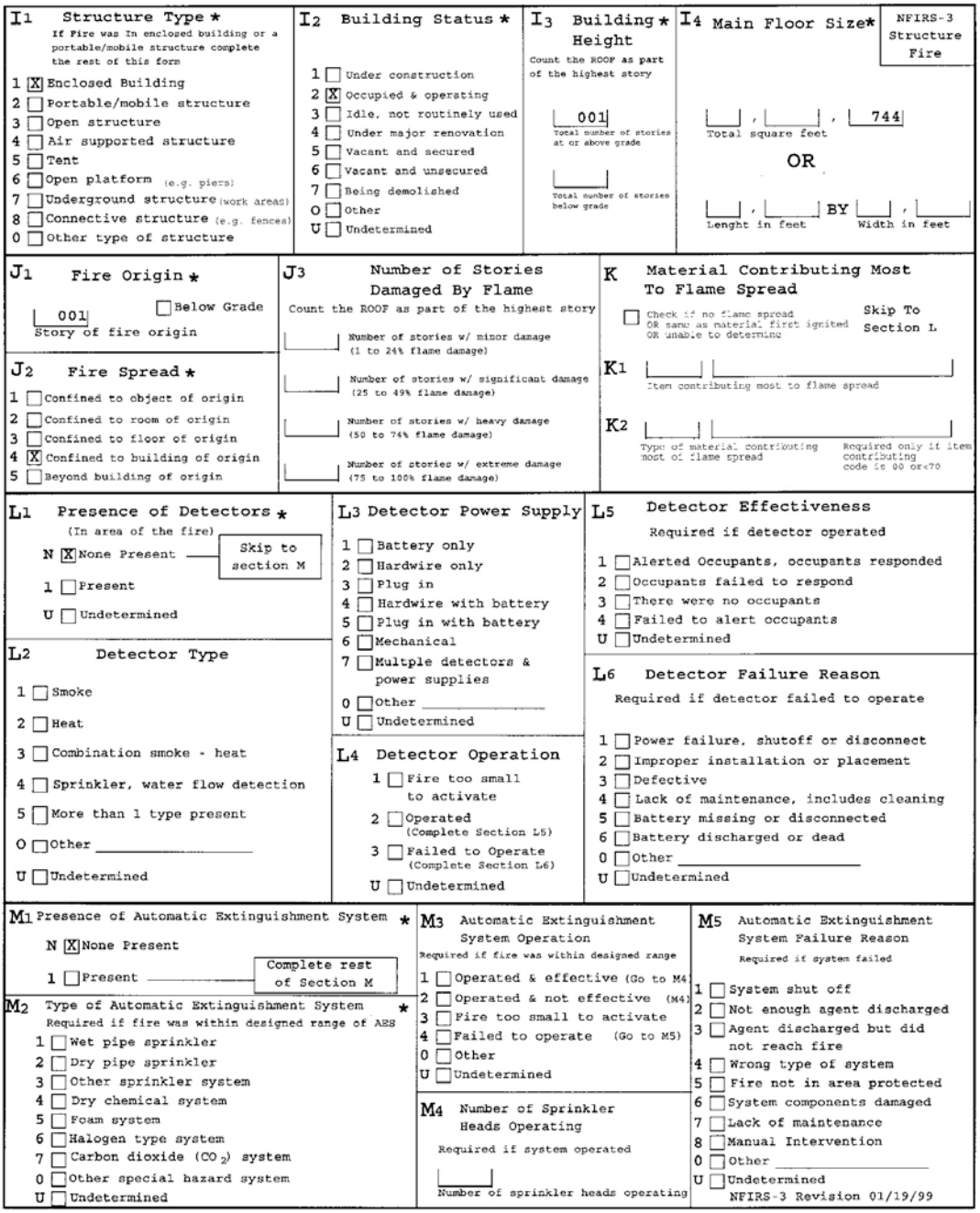
H2 Mobile Property Type & Make
Xobile property type
Mobile property make
Xoblie property model
Year
License Plate Number
State
VIN Number

Local Use
☐ Pre-Fire Plan Available
Some of the information presented in this report may be based upon reports from other Agencies
☐ Arson report attached
☐ Police report attached
☐ Coroner report attached
☐ Other reports attached

NFIRS-2 Revision 01/19/99

Appendix B (cont.)

Fire Run #1153



I1 Structure Type *
If Fire was In enclosed building or a portable/mobile structure complete the rest of this form
1 [X] Enclosed Building
2 [ ] Portable/mobile structure
3 [ ] Open structure
4 [ ] Air supported structure
5 [ ] Tent
6 [ ] Open platform (e.g. piers)
7 [ ] Underground structure (work areas)
8 [ ] Connective structure (e.g. fences)
0 [ ] Other type of structure

I2 Building Status *
1 [ ] Under construction
2 [X] Occupied & operating
3 [ ] Idle, not routinely used
4 [ ] Under major renovation
5 [ ] Vacant and secured
6 [ ] Vacant and unsecured
7 [ ] Being demolished
O [ ] Other
U [ ] Undetermined

I3 Building Height *
Count the ROOF as part of the highest story
001 Total number of stories at or above grade
Total number of stories below grade

I4 Main Floor Size* NFIRS-3 Structure Fire
, , 744 Total square feet
OR
, BY , Lenght in feet / Width in feet

J1 Fire Origin *
001 Story of fire origin
[ ] Below Grade

J2 Fire Spread *
1 [ ] Confined to object of origin
2 [ ] Confined to room of origin
3 [ ] Confined to floor of origin
4 [X] Confined to building of origin
5 [ ] Beyond building of origin

J3 Number of Stories Damaged By Flame
Count the ROOF as part of the highest story
Number of stories w/ minor damage (1 to 24% flame damage)
Number of stories w/ significant damage (25 to 49% flame damage)
Number of stories w/ heavy damage (50 to 74% flame damage)
Number of stories w/ extreme damage (75 to 100% flame damage)

K Material Contributing Most To Flame Spread
[ ] Check if no flame spread OR same as material first ignited OR unable to determine — Skip To Section L
K1 Item contributing most to flame spread
K2 Type of material contributing most of flame spread — Required only if item contributing code is 00 or<70

L1 Presence of Detectors *
(In area of the fire)
N [X] None Present — Skip to section M
1 [ ] Present
U [ ] Undetermined

L2 Detector Type
1 [ ] Smoke
2 [ ] Heat
3 [ ] Combination smoke - heat
4 [ ] Sprinkler, water flow detection
5 [ ] More than 1 type present
O [ ] Other _____
U [ ] Undetermined

L3 Detector Power Supply
1 [ ] Battery only
2 [ ] Hardwire only
3 [ ] Plug in
4 [ ] Hardwire with battery
5 [ ] Plug in with battery
6 [ ] Mechanical
7 [ ] Multple detectors & power supplies
0 [ ] Other _____
U [ ] Undetermined

L4 Detector Operation
1 [ ] Fire too small to activate
2 [ ] Operated (Complete Section L5)
3 [ ] Failed to Operate (Complete Section L6)
U [ ] Undetermined

L5 Detector Effectiveness
Required if detector operated
1 [ ] Alerted Occupants, occupants responded
2 [ ] Occupants failed to respond
3 [ ] There were no occupants
4 [ ] Failed to alert occupants
U [ ] Undetermined

L6 Detector Failure Reason
Required if detector failed to operate
1 [ ] Power failure, shutoff or disconnect
2 [ ] Improper installation or placement
3 [ ] Defective
4 [ ] Lack of maintenance, includes cleaning
5 [ ] Battery missing or disconnected
6 [ ] Battery discharged or dead
0 [ ] Other _____
U [ ] Undetermined

M1 Presence of Automatic Extinguishment System *
N [X] None Present
1 [ ] Present — Complete rest of Section M

M2 Type of Automatic Extinguishment System *
Required if fire was within designed range of AES
1 [ ] Wet pipe sprinkler
2 [ ] Dry pipe sprinkler
3 [ ] Other sprinkler system
4 [ ] Dry chemical system
5 [ ] Foam system
6 [ ] Halogen type system
7 [ ] Carbon dioxide (CO_2) system
0 [ ] Other special hazard system
U [ ] Undetermined

M3 Automatic Extinguishment System Operation
Required if fire was within designed range
1 [ ] Operated & effective (Go to M4)
2 [ ] Operated & not effective (M4)
3 [ ] Fire too small to activate
4 [ ] Failed to operate (Go to M5)
0 [ ] Other
U [ ] Undetermined

M4 Number of Sprinkler Heads Operating
Required if system operated
Number of sprinkler heads operating

M5 Automatic Extinguishment System Failure Reason
Required if system failed
1 [ ] System shut off
2 [ ] Not enough agent discharged
3 [ ] Agent discharged but did not reach fire
4 [ ] Wrong type of system
5 [ ] Fire not in area protected
6 [ ] System components damaged
7 [ ] Lack of maintenance
8 [ ] Manual Intervention
0 [ ] Other _____
U [ ] Undetermined
NFIRS-3 Revision 01/19/99

North Ridgeville Fire Dept 47023 06/26/2005 05-0001153

Appendix C

Hydrant Flushing Procedure

HYDRANT FLUSHING

PLACEMENT OF BLOW OFF VALVES:

STEP #1:
When starting on a street - install a Blow Off Valve on Hydrants # 2, 5, & 8

STEP #2:
Flush Hydrant #1 - *(See Hydrant Flushing Procedures Sheet Attached)*
When complete, install Blow Off Valve (4th additional still on truck) onto Hydrant #1.

STEP #3:
Remove Blow Off Valve from Hydrant #2 and put on truck. Flush Hydrants #2, 3, & 4. Install Blow Off Valve (from truck) on Hydrant #4 after flushing.

Step #4:
Remove Blow Off Valve from Hydrant #5 and put on truck, Flush Hydrants #5, 6, & 7. Install Blow Off Valve (from truck) on Hydrant #7 after flushing. Return to Hydrants #1 and #4 to remove Blow Off Valves.

Step #5:
Remove Blow Off Valve from Hydrant #8. Install a Blow Off Valve on Hydrants # 10, 13 & 17. Flush Hydrants #8 & 9. Remove Blow Off Valve from Hydrant #7 and install on Hydrant #9. Remove Hydrant #10's Blow off Valve. Flush Hydrant #10, 11 & 12. Install Blow Off Valve (#10's on truck)onto Hydrant #12. Keep repeating the above rotation.

NOTE: at no time should the number of hydrants being flushed between Blow Off Valves exceed 3 hydrants.

1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10

Appendix C (cont.)

Hydrant Flushing Procedure

HYDRANT FLUSHING PROCEDURES

1.) Remove all caps and inspect rubber gaskets.

2.) Lightly clean brass threads with wire brush.

3.) Saturate threads with WD40.

4.) If hydrant stem nut is equipped with a grease fitting, remove bolt, install grease fitting and apply 2 to 3 pumps of lithium grease, remove grease fitting and install bolt.

5.) Open stem nut ¼ turn to fill hydrant barrel with water.

6.) Close stem nut. Install test gauge on the 2 1/2" outlet that would cause the most property damage if water were flowing from that outlet.

7.) Install the two remaining hydrant caps and open stem nut three turns and observe static pressure.

8.) Close stem nut and document static pressure.

9.) Using discretion as not to interrupt traffic or inflict property damage, remove hydrant cap on the test outlet.

10.) Slowly open stem nut fully and observe flow pressure. Continue flowing water until clear.

11.) Slowly close stem nut until hydrant valve is seated. Document flow pressure and verify that the hydrant drains.

12.) Verify street valve location.

13.) Install hydrant caps hand tight and give each cap a ¼ turn with hydrant wrench.

Appendix C (cont.)

Hydrant Flushing Procedure

PROCEDURE FOR ADJUSTING BLOW OFF VALVE

1.) Remove 2 1/2" Cap

2.) Install Blow Off on 2 1/2" Outlet (hand tight)

3.) Turn on Hydrant fully

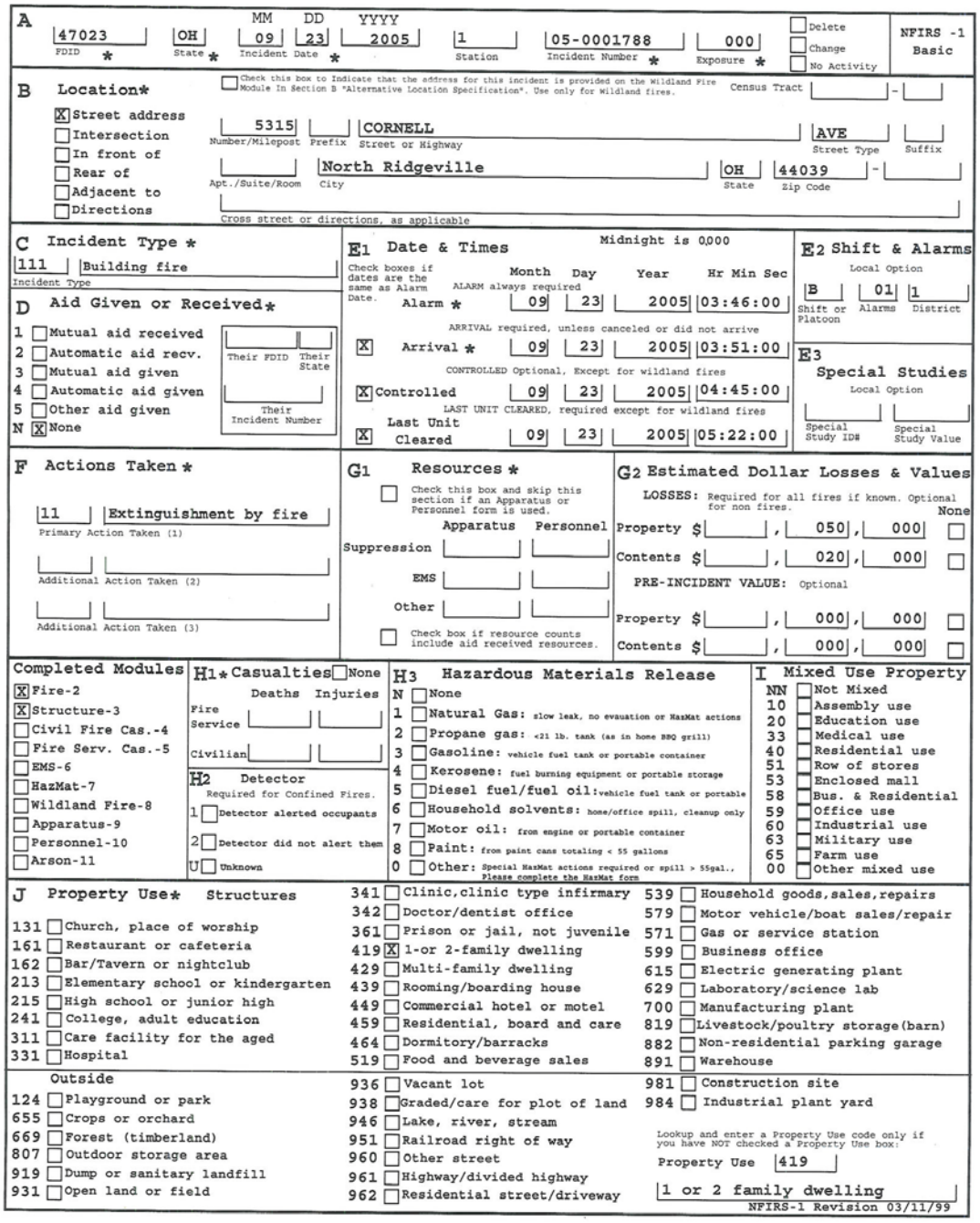
4.) Adjust Blow Off Stem counter clockwise until Blow Off opens (full water flow)

5.) Adjust Blow Off Stem clockwise until Blow Off closes. (No water or trickle of water)

6.) Hand tighten Lock Nut on Stem

Appendix D

Fire Run #1178



A
47023 FDID * | OH State * | MM 09 DD 23 YYYY 2005 Incident Date * | 1 Station | 05-0001788 Incident Number * | 000 Exposure * | ☐ Delete ☐ Change ☐ No Activity | NFIRS -1 Basic

B Location*
☐ Check this box to Indicate that the address for this incident is provided on the Wildland Fire Module In Section B "Alternative Location Specification". Use only for Wildland fires.
Census Tract ____ - ____
☒ Street address ☐ Intersection ☐ In front of ☐ Rear of ☐ Adjacent to ☐ Directions
5315 Number/Milepost | ____ Prefix | CORNELL Street or Highway | AVE Street Type | ____ Suffix
____ Apt./Suite/Room | North Ridgeville City | OH State | 44039 Zip Code - ____
Cross street or directions, as applicable

C Incident Type *
111 Building fire
Incident Type

D Aid Given or Received*
1 ☐ Mutual aid received
2 ☐ Automatic aid recv.
3 ☐ Mutual aid given
4 ☐ Automatic aid given
5 ☐ Other aid given
N ☒ None
Their FDID | Their State
Their Incident Number

E1 Date & Times
Midnight is 0,000
Check boxes if dates are the same as Alarm Date.
Month Day Year Hr Min Sec
Alarm * (ALARM always required) 09 23 2005 03:46:00
☒ Arrival * (ARRIVAL required, unless canceled or did not arrive) 09 23 2005 03:51:00
☒ Controlled (CONTROLLED Optional, Except for wildland fires) 09 23 2005 04:45:00
☒ Last Unit Cleared (LAST UNIT CLEARED, required except for wildland fires) 09 23 2005 05:22:00

E2 Shift & Alarms
Local Option
B Shift or Platoon | 01 Alarms | 1 District

E3 Special Studies
Local Option
Special Study ID# | Special Study Value

F Actions Taken *
11 Extinguishment by fire
Primary Action Taken (1)
Additional Action Taken (2)
Additional Action Taken (3)

G1 Resources *
☐ Check this box and skip this section if an Apparatus or Personnel form is used.
Apparatus Personnel
Suppression
EMS
Other
☐ Check box if resource counts include aid received resources.

G2 Estimated Dollar Losses & Values
LOSSES: Required for all fires if known. Optional for non fires. None
Property $ ____ , 050 , 000 ☐
Contents $ ____ , 020 , 000 ☐
PRE-INCIDENT VALUE: Optional
Property $ ____ , 000 , 000 ☐
Contents $ ____ , 000 , 000 ☐

Completed Modules
☒ Fire-2
☒ Structure-3
☐ Civil Fire Cas.-4
☐ Fire Serv. Cas.-5
☐ EMS-6
☐ HazMat-7
☐ Wildland Fire-8
☐ Apparatus-9
☐ Personnel-10
☐ Arson-11

H1* Casualties ☐ None
Deaths Injuries
Fire Service
Civilian

H2 Detector
Required for Confined Fires.
1 ☐ Detector alerted occupants
2 ☐ Detector did not alert them
U ☐ Unknown

H3 Hazardous Materials Release
N ☐ None
1 ☐ Natural Gas: slow leak, no evauation or HazMat actions
2 ☐ Propane gas: <21 lb. tank (as in home BBQ grill)
3 ☐ Gasoline: vehicle fuel tank or portable container
4 ☐ Kerosene: fuel burning equipment or portable storage
5 ☐ Diesel fuel/fuel oil: vehicle fuel tank or portable
6 ☐ Household solvents: home/office spill, cleanup only
7 ☐ Motor oil: from engine or portable container
8 ☐ Paint: from paint cans totaling < 55 gallons
0 ☐ Other: Special HazMat actions required or spill > 55gal., Please complete the HazMat form

I Mixed Use Property
NN ☐ Not Mixed
10 ☐ Assembly use
20 ☐ Education use
33 ☐ Medical use
40 ☐ Residential use
51 ☐ Row of stores
53 ☐ Enclosed mall
58 ☐ Bus. & Residential
59 ☐ Office use
60 ☐ Industrial use
63 ☐ Military use
65 ☐ Farm use
00 ☐ Other mixed use

J Property Use* Structures
131 ☐ Church, place of worship
161 ☐ Restaurant or cafeteria
162 ☐ Bar/Tavern or nightclub
213 ☐ Elementary school or kindergarten
215 ☐ High school or junior high
241 ☐ College, adult education
311 ☐ Care facility for the aged
331 ☐ Hospital
341 ☐ Clinic,clinic type infirmary
342 ☐ Doctor/dentist office
361 ☐ Prison or jail, not juvenile
419 ☒ 1-or 2-family dwelling
429 ☐ Multi-family dwelling
439 ☐ Rooming/boarding house
449 ☐ Commercial hotel or motel
459 ☐ Residential, board and care
464 ☐ Dormitory/barracks
519 ☐ Food and beverage sales
539 ☐ Household goods,sales,repairs
579 ☐ Motor vehicle/boat sales/repair
571 ☐ Gas or service station
599 ☐ Business office
615 ☐ Electric generating plant
629 ☐ Laboratory/science lab
700 ☐ Manufacturing plant
819 ☐ Livestock/poultry storage(barn)
882 ☐ Non-residential parking garage
891 ☐ Warehouse

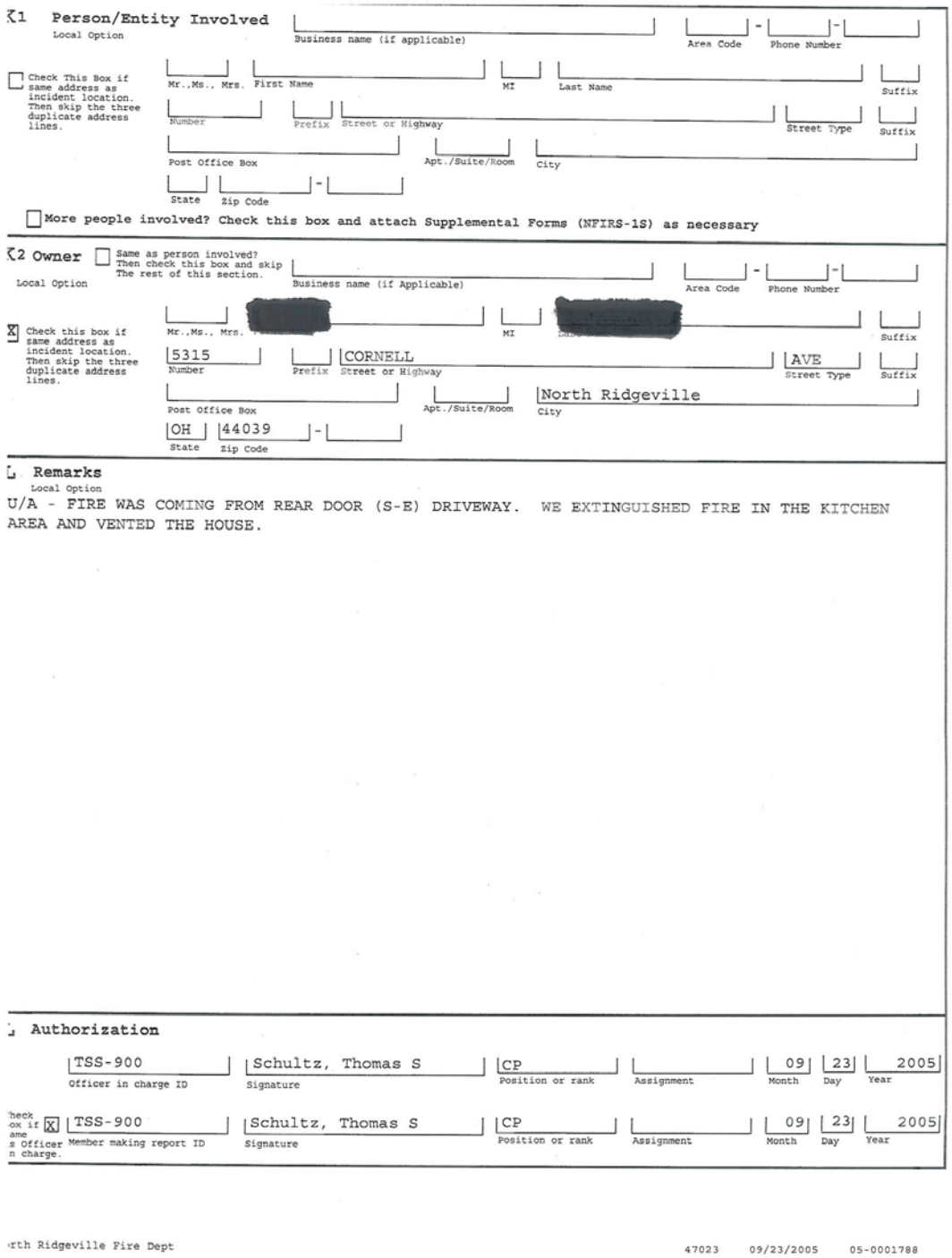
Outside
124 ☐ Playground or park
655 ☐ Crops or orchard
669 ☐ Forest (timberland)
807 ☐ Outdoor storage area
919 ☐ Dump or sanitary landfill
931 ☐ Open land or field
936 ☐ Vacant lot
938 ☐ Graded/care for plot of land
946 ☐ Lake, river, stream
951 ☐ Railroad right of way
960 ☐ Other street
961 ☐ Highway/divided highway
962 ☐ Residential street/driveway
981 ☐ Construction site
984 ☐ Industrial plant yard

Lookup and enter a Property Use code only if you have NOT checked a Property Use box:
Property Use 419
1 or 2 family dwelling
NFIRS-1 Revision 03/11/99

North Ridgeville Fire Dept 47023 09/23/2005 05-0001788

Appendix D (cont.)

Fire Run #1788



Person/Entity Involved (Local Option)

Business name (if applicable) | Area Code | Phone Number

☐ Check This Box if same address as incident location. Then skip the three duplicate address lines.

Mr.,Ms., Mrs. | First Name | MI | Last Name | Suffix

Number | Prefix | Street or Highway | Street Type | Suffix

Post Office Box | Apt./Suite/Room | City

State | Zip Code

☐ More people involved? Check this box and attach Supplemental Forms (NFIRS-1S) as necessary

Owner (Local Option) ☐ Same as person involved? Then check this box and skip The rest of this section.

Business name (if Applicable) | Area Code | Phone Number

☒ Check this box if same address as incident location. Then skip the three duplicate address lines.

Mr.,Ms., Mrs. [redacted] | MI | [redacted] | Suffix

5315 | Number | Prefix | CORNELL | Street or Highway | AVE | Street Type | Suffix

Post Office Box | Apt./Suite/Room | North Ridgeville | City

OH | State | 44039 | Zip Code

Remarks (Local Option)

U/A - FIRE WAS COMING FROM REAR DOOR (S-E) DRIVEWAY. WE EXTINGUISHED FIRE IN THE KITCHEN AREA AND VENTED THE HOUSE.

Authorization

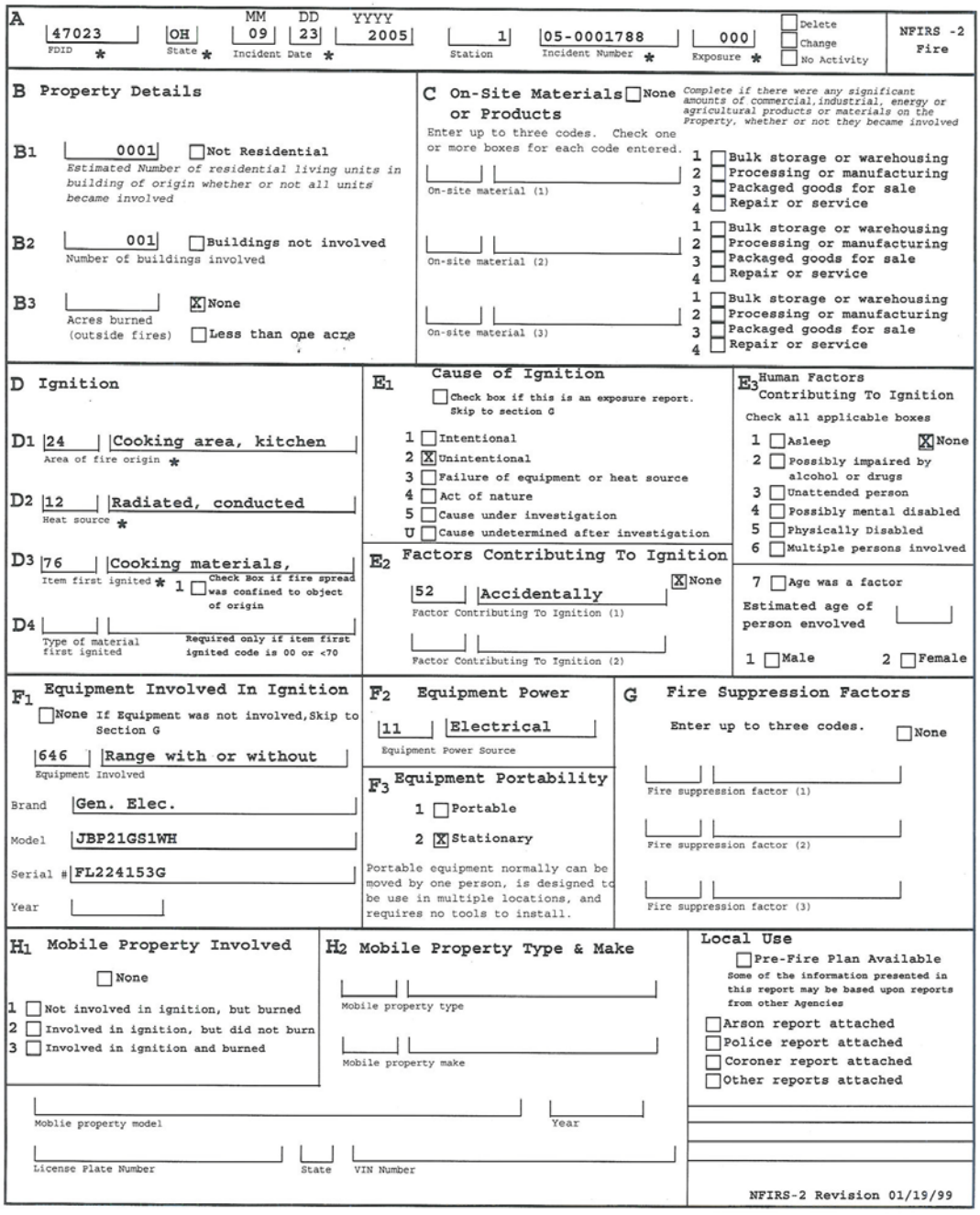
Officer in charge ID	Signature	Position or rank	Assignment	Month	Day	Year
TSS-900	Schultz, Thomas S	CP		09	23	2005

Check box if same as Officer in charge.	Member making report ID	Signature	Position or rank	Assignment	Month	Day	Year
☒	TSS-900	Schultz, Thomas S	CP		09	23	2005

rth Ridgeville Fire Dept 47023 09/23/2005 05-0001788

Appendix D (cont.)

Fire Run #1788



A
47023 (FDID *) | OH (State *) | MM 09 DD 23 YYYY 2005 (Incident Date *) | 1 (Station) | 05-0001788 (Incident Number *) | 000 (Exposure *) | ☐ Delete ☐ Change ☐ No Activity | NFIRS -2 Fire

B Property Details

B1 0001 ☐ Not Residential
Estimated Number of residential living units in building of origin whether or not all units became involved

B2 001 ☐ Buildings not involved
Number of buildings involved

B3 ☐ Acres burned (outside fires) ☒ None ☐ Less than one acre

C On-Site Materials or Products ☐ None
Complete if there were any significant amounts of commercial, industrial, energy or agricultural products or materials on the Property, whether or not they became involved
Enter up to three codes. Check one or more boxes for each code entered.

On-site material (1)
1 ☐ Bulk storage or warehousing
2 ☐ Processing or manufacturing
3 ☐ Packaged goods for sale
4 ☐ Repair or service

On-site material (2)
1 ☐ Bulk storage or warehousing
2 ☐ Processing or manufacturing
3 ☐ Packaged goods for sale
4 ☐ Repair or service

On-site material (3)
1 ☐ Bulk storage or warehousing
2 ☐ Processing or manufacturing
3 ☐ Packaged goods for sale
4 ☐ Repair or service

D Ignition

D1 24 Cooking area, kitchen (Area of fire origin *)

D2 12 Radiated, conducted (Heat source *)

D3 76 Cooking materials, (Item first ignited *) 1 ☐ Check Box if fire spread was confined to object of origin

D4 ☐ (Type of material first ignited) Required only if item first ignited code is 00 or <70

E1 Cause of Ignition
☐ Check box if this is an exposure report. Skip to section G
1 ☐ Intentional
2 ☒ Unintentional
3 ☐ Failure of equipment or heat source
4 ☐ Act of nature
5 ☐ Cause under investigation
U ☐ Cause undetermined after investigation

E2 Factors Contributing To Ignition ☒ None
52 Accidentally (Factor Contributing To Ignition (1))
☐ (Factor Contributing To Ignition (2))

E3 Human Factors Contributing To Ignition
Check all applicable boxes
1 ☐ Asleep ☒ None
2 ☐ Possibly impaired by alcohol or drugs
3 ☐ Unattended person
4 ☐ Possibly mental disabled
5 ☐ Physically Disabled
6 ☐ Multiple persons involved
7 ☐ Age was a factor
Estimated age of person envolved ☐
1 ☐ Male 2 ☐ Female

F1 Equipment Involved In Ignition
☐ None If Equipment was not involved, Skip to Section G
646 Range with or without (Equipment Involved)
Brand Gen. Elec.
Model JBP21GS1WH
Serial # FL224153G
Year ☐

F2 Equipment Power
11 Electrical (Equipment Power Source)

F3 Equipment Portability
1 ☐ Portable
2 ☒ Stationary
Portable equipment normally can be moved by one person, is designed to be use in multiple locations, and requires no tools to install.

G Fire Suppression Factors
Enter up to three codes. ☐ None
☐ (Fire suppression factor (1))
☐ (Fire suppression factor (2))
☐ (Fire suppression factor (3))

H1 Mobile Property Involved
☐ None
1 ☐ Not involved in ignition, but burned
2 ☐ Involved in ignition, but did not burn
3 ☐ Involved in ignition and burned

H2 Mobile Property Type & Make
☐ (Mobile property type)
☐ (Mobile property make)
☐ (Moblie property model) ☐ (Year)
☐ (License Plate Number) ☐ (State) ☐ (VIN Number)

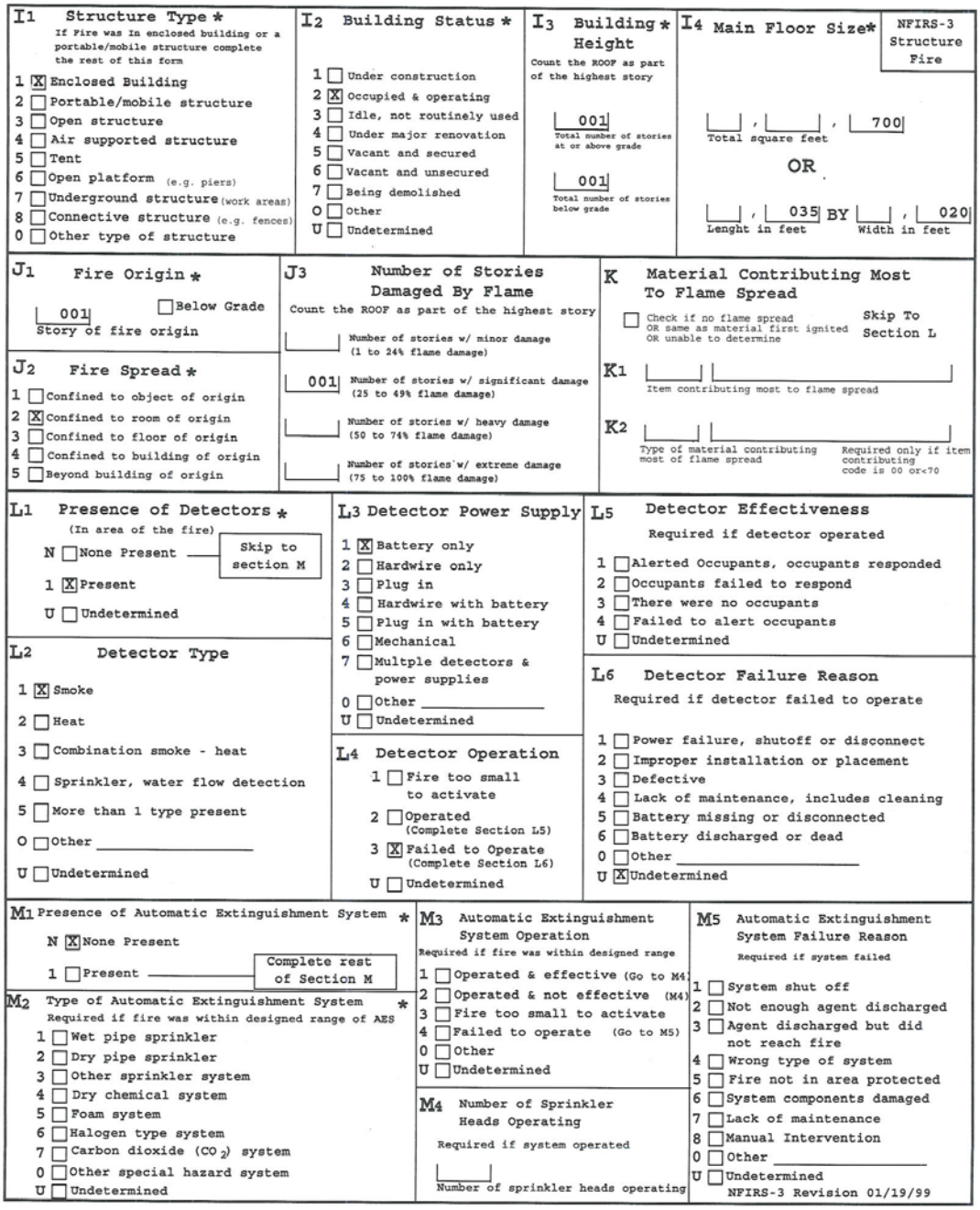
Local Use
☐ Pre-Fire Plan Available
Some of the information presented in this report may be based upon reports from other Agencies
☐ Arson report attached
☐ Police report attached
☐ Coroner report attached
☐ Other reports attached

NFIRS-2 Revision 01/19/99

North Ridgeville Fire Dept 47023 09/23/2005 05-0001788

Appendix D (cont.)

Fire Run #1788



I1 Structure Type *
If Fire was In enclosed building or a portable/mobile structure complete the rest of this form
1 [X] Enclosed Building
2 [ ] Portable/mobile structure
3 [ ] Open structure
4 [ ] Air supported structure
5 [ ] Tent
6 [ ] Open platform (e.g. piers)
7 [ ] Underground structure (work areas)
8 [ ] Connective structure (e.g. fences)
0 [ ] Other type of structure

I2 Building Status *
1 [ ] Under construction
2 [X] Occupied & operating
3 [ ] Idle, not routinely used
4 [ ] Under major renovation
5 [ ] Vacant and secured
6 [ ] Vacant and unsecured
7 [ ] Being demolished
O [ ] Other
U [ ] Undetermined

I3 Building * Height
Count the ROOF as part of the highest story
001 Total number of stories at or above grade
001 Total number of stories below grade

I4 Main Floor Size* NFIRS-3 Structure Fire
, , 700 Total square feet
OR
, 035 BY , 020
Lenght in feet Width in feet

J1 Fire Origin *
001 Story of fire origin
[ ] Below Grade

J2 Fire Spread *
1 [ ] Confined to object of origin
2 [X] Confined to room of origin
3 [ ] Confined to floor of origin
4 [ ] Confined to building of origin
5 [ ] Beyond building of origin

J3 Number of Stories Damaged By Flame
Count the ROOF as part of the highest story
Number of stories w/ minor damage (1 to 24% flame damage)
001 Number of stories w/ significant damage (25 to 49% flame damage)
Number of stories w/ heavy damage (50 to 74% flame damage)
Number of stories w/ extreme damage (75 to 100% flame damage)

K Material Contributing Most To Flame Spread
[ ] Check if no flame spread OR same as material first ignited OR unable to determine — Skip To Section L
K1 Item contributing most to flame spread
K2 Type of material contributing most of flame spread — Required only if item contributing code is 00 or<70

L1 Presence of Detectors *
(In area of the fire)
N [ ] None Present — Skip to section M
1 [X] Present
U [ ] Undetermined

L2 Detector Type
1 [X] Smoke
2 [ ] Heat
3 [ ] Combination smoke - heat
4 [ ] Sprinkler, water flow detection
5 [ ] More than 1 type present
O [ ] Other
U [ ] Undetermined

L3 Detector Power Supply
1 [X] Battery only
2 [ ] Hardwire only
3 [ ] Plug in
4 [ ] Hardwire with battery
5 [ ] Plug in with battery
6 [ ] Mechanical
7 [ ] Multple detectors & power supplies
0 [ ] Other
U [ ] Undetermined

L4 Detector Operation
1 [ ] Fire too small to activate
2 [ ] Operated (Complete Section L5)
3 [X] Failed to Operate (Complete Section L6)
U [ ] Undetermined

L5 Detector Effectiveness
Required if detector operated
1 [ ] Alerted Occupants, occupants responded
2 [ ] Occupants failed to respond
3 [ ] There were no occupants
4 [ ] Failed to alert occupants
U [ ] Undetermined

L6 Detector Failure Reason
Required if detector failed to operate
1 [ ] Power failure, shutoff or disconnect
2 [ ] Improper installation or placement
3 [ ] Defective
4 [ ] Lack of maintenance, includes cleaning
5 [ ] Battery missing or disconnected
6 [ ] Battery discharged or dead
0 [ ] Other
U [X] Undetermined

M1 Presence of Automatic Extinguishment System *
N [X] None Present
1 [ ] Present — Complete rest of Section M

M2 Type of Automatic Extinguishment System *
Required if fire was within designed range of AES
1 [ ] Wet pipe sprinkler
2 [ ] Dry pipe sprinkler
3 [ ] Other sprinkler system
4 [ ] Dry chemical system
5 [ ] Foam system
6 [ ] Halogen type system
7 [ ] Carbon dioxide (CO_2) system
0 [ ] Other special hazard system
U [ ] Undetermined

M3 Automatic Extinguishment System Operation
Required if fire was within designed range
1 [ ] Operated & effective (Go to M4)
2 [ ] Operated & not effective (M4)
3 [ ] Fire too small to activate
4 [ ] Failed to operate (Go to M5)
0 [ ] Other
U [ ] Undetermined

M4 Number of Sprinkler Heads Operating
Required if system operated
Number of sprinkler heads operating

M5 Automatic Extinguishment System Failure Reason
Required if system failed
1 [ ] System shut off
2 [ ] Not enough agent discharged
3 [ ] Agent discharged but did not reach fire
4 [ ] Wrong type of system
5 [ ] Fire not in area protected
6 [ ] System components damaged
7 [ ] Lack of maintenance
8 [ ] Manual Intervention
0 [ ] Other
U [ ] Undetermined

NFIRS-3 Revision 01/19/99

North Ridgeville Fire Dept 47023 09/23/2005 05-0001788

Appendix E

Survey Cover Letter

CITY OF NORTH RIDGEVILLE
Division of Fire

7090 Avon Belden Road
North Ridgeville, OH 44039

G. David Gillock
Mayor

Richard E. Miller
Fire Chief

PLEASE READ!!

You are receiving this letter to request your participation in a survey about fire hydrant maintenance in northeast Ohio. My name is John C. Reese and I am an Assistant Chief with the North Ridgeville Fire Department. I am currently in my second year of the National Fire Academy's Executive Fire Officer Program and need your input for my upcoming applied research project.

In the past, I have used the online survey websites to conduct a survey, but had horrible results. This year I wanted to apply to my peers with whom I may have direct contact with in an attempt to get a better response. If you know my name or face, please take this opportunity to help me out. If you don't know me, please help me by completing the survey and I will attempt to introduce myself to you in the future. Either way, these surveys help all of us by advancing the research that is completed in today's fire service.

This survey should only take about 10 minutes of your time. Please fill it out and place it in the enclosed postage paid envelope for return by May 31, 2009. Thank you for your time and help!

Assistant Chief John C. Reese
North Ridgeville Fire Department

Appendix F

Fire Hydrant Maintenance Survey

FIRE HYDRANT MAINTENANCE SURVEY

Executive Fire Officer Program
Applied Research Project

Thank you for your time and cooperation. Please fill in the survey and return it in the enclosed postage paid envelope.

1. **What is the make-up of your fire department?**

   □ **Career**
   □ **Part-paid**
   □ **Volunteer**
   □ **Combination**

2. **How many members make up your fire department?** ***(please provide a number)***

   _____ **Career**

   _____ **Part-paid**

   _____ **Volunteer**

   _____ **Combination**

3. **What is your typical daily staffing? Please explain.**

   _____
   _____
   _____

4. **What is the population of the area which you serve?**

   □ **0 – 5,000**
   □ **5,000 – 10,000**
   □ **10,000 – 25,000**
   □ **25,000 – 40,000**
   □ **More than 40,000**

Appendix F (cont.)

Hydrant Maintenance Survey

5. How many fire hydrants are there in the area which you serve?

- □ **Under 500**
- □ **500 – 1,000**
- □ **1,000 – 1,500**
- □ **1,500 – 2,000**
- □ **More than 2,000**

6. How many of the hydrants from question #5 are private hydrants?

_____

7. Who in your area performs the fire hydrant flushing duties?

- □ **Water Department** ***(seasonal employees)***
- □ **Water Department** ***(full-time employees)***
- □ **Fire Department**
- □ **Other** _____

8. If your fire department performs hydrant flushing, how are the duties assigned?

- □ **All on-duty companies** ***(in-service)***
- □ **A portion of on-duty companies** ***(in-service)***
- □ **A portion of on-duty companies** ***(out of service)***
- □ **Paid off-duty personnel**
- □ **Other** _____

9. How often are hydrants flushed in the area in which you serve?

- □ **Less than once a year**
- □ **Once a year**
- □ **More than once a year**

10. What type of maintenance is performed on your hydrants while flushing them?

- □ **Lubrication**
- □ **Static Pressure Test**
- □ **Flow Pressure Test**
- □ **Residual Pressure Test**
- □ **Painting**
- □ **Repair** ***(replacing worn parts)***

Appendix F (cont.)

Hydrant Maintenance Survey

11. Is every hydrant that is flushed also pressure tested?

- ☐ Yes
- ☐ No

12. If you answered no to question #9, what determines whether or not a hydrant is pressure tested?

_____

_____

_____

13. Does your city/township/village flush and inspect private hydrants or is it the responsibility of the property owner?

- ☐ city/township/village
- ☐ Property owner

14. How does your organization maintain fire hydrant records?

- ☐ Hydrant card system
- ☐ Firehouse software
- ☐ Other _____

15. What is your department's ISO rating?

_____

OPTIONAL INFORMATION:

NAME: _____ **RANK:** _____

DEPARTMENT: _____

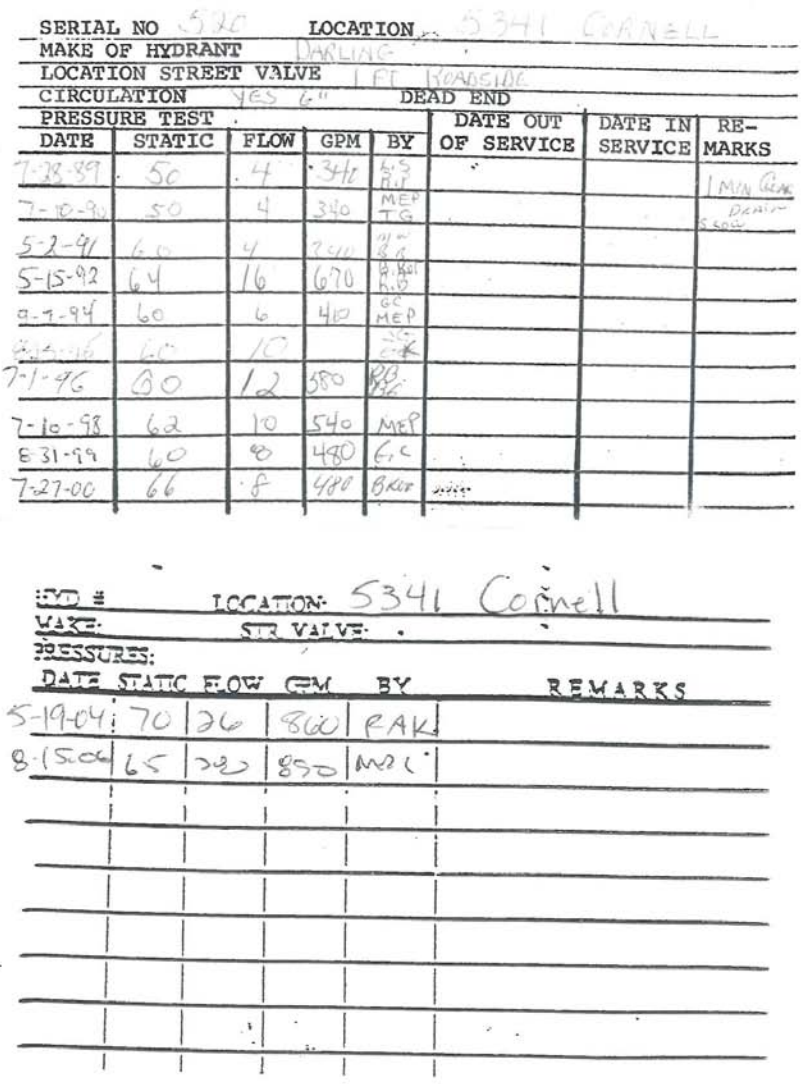
EMAIL: _____

PHONE: _____

THANK YOU FOR YOUR TIME AND INPUT!

Appendix G

North Ridgeville Fire Department Hydrant Card



SERIAL NO 520 LOCATION 5341 CORNELL
MAKE OF HYDRANT DARLING
LOCATION STREET VALVE 1 FT ROADSIDE
CIRCULATION YES 6" DEAD END
PRESSURE TEST

DATE	STATIC	FLOW	GPM	BY	DATE OUT OF SERVICE	DATE IN SERVICE	REMARKS
7-28-89	50	4	340				MIN CLEAR
7-10-90	50	4	340	MEP TG			DRAIN S SOIL
5-2-91	60	4	340				
5-15-92	64	16	670				
9-7-94	60	6	410	MEP			
6-24-96	60	10					
7-1-96	60	12	580				
7-10-98	62	10	540	MEP			
8-31-99	60	8	480	GC			
7-27-00	66	8	480	BKR			

HYD # LOCATION 5341 Cornell
MAKE STR VALVE
PRESSURES:

DATE	STATIC	FLOW	GPM	BY	REMARKS
5-19-04	70	26	860	RAK	
8-15-04	65	28	850	MRC	

Appendix H

City of North Ridgeville Pay Scales

CITY OF NORTH RIDGEVILLE 2009

PART-TIME		2009	PART-TIME		2009
			P/T Sexton Asst.		
P/T Zoning Inspector	A	21.01	P/T Sexton	A	14.12
	B	20.55		B	13.65
	C	20.08		C	13.21
P/T Lic. Bldg Insp.	A	18.01	P/T S Central Park	A	11.57
	B	17.57	Manager	B	11.27
	C	17.09		C	10.96
P/T Res Proj Rep	A	18.01	P/T Shady Dr Comple:	A	11.57
	B	17.57	Manager	B	11.27
	C	17.09		C	10.96
P/T Mechanic	A	16.00	P/T Site Supervisor	A	9.82
	B	15.53		B	9.44
	C	15.09		C	9.06
P/T Secretary	A	13.22	P/T Crew Leader	A	9.82
	B	12.76		B	9.44
	C	12.32		C	9.06
P/T Tax Specialist	A	22.61	P/T Lifeguard	A	8.92
	B	18.08		B	8.63
	C	13.57		C	8.32
P/T Data Specialist	A	14.54	P/T Camp Counselor	A	8.92
	B	14.05		B	8.63
	C	13.57		C	8.32
P/T Clerk Typist	A	11.74	P/T Labor	A	8.54
	B	11.23		B	8.24
	C	10.66		C	7.94
	D	8.37			
P/T Meter Reader	A	13.37	P/T Cashier	A	8.38
	B	13.04		B	8.17
	C	12.57		C	7.94
	D	10.68			
P/T Dispatcher	A	16.03	P/T Bus Driver	A	11.17
	B	15.46		B	10.79
	C	13.32		C	10.39
P/T Services Division	A	21.24	P/T Case Manager	A	14.58
Assistant	B	20.42		B	14.12
	C	19.64		C	13.66
P/T Humane Officer	A	16.25			
	B	15.50			
	C	15.00			

N:\EXCEL\PAYROLL\09 PAYROLL\2009 dhwage .xlsPART TIME 4/21/2009 3:37 PM